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WORLD PETROLEUM

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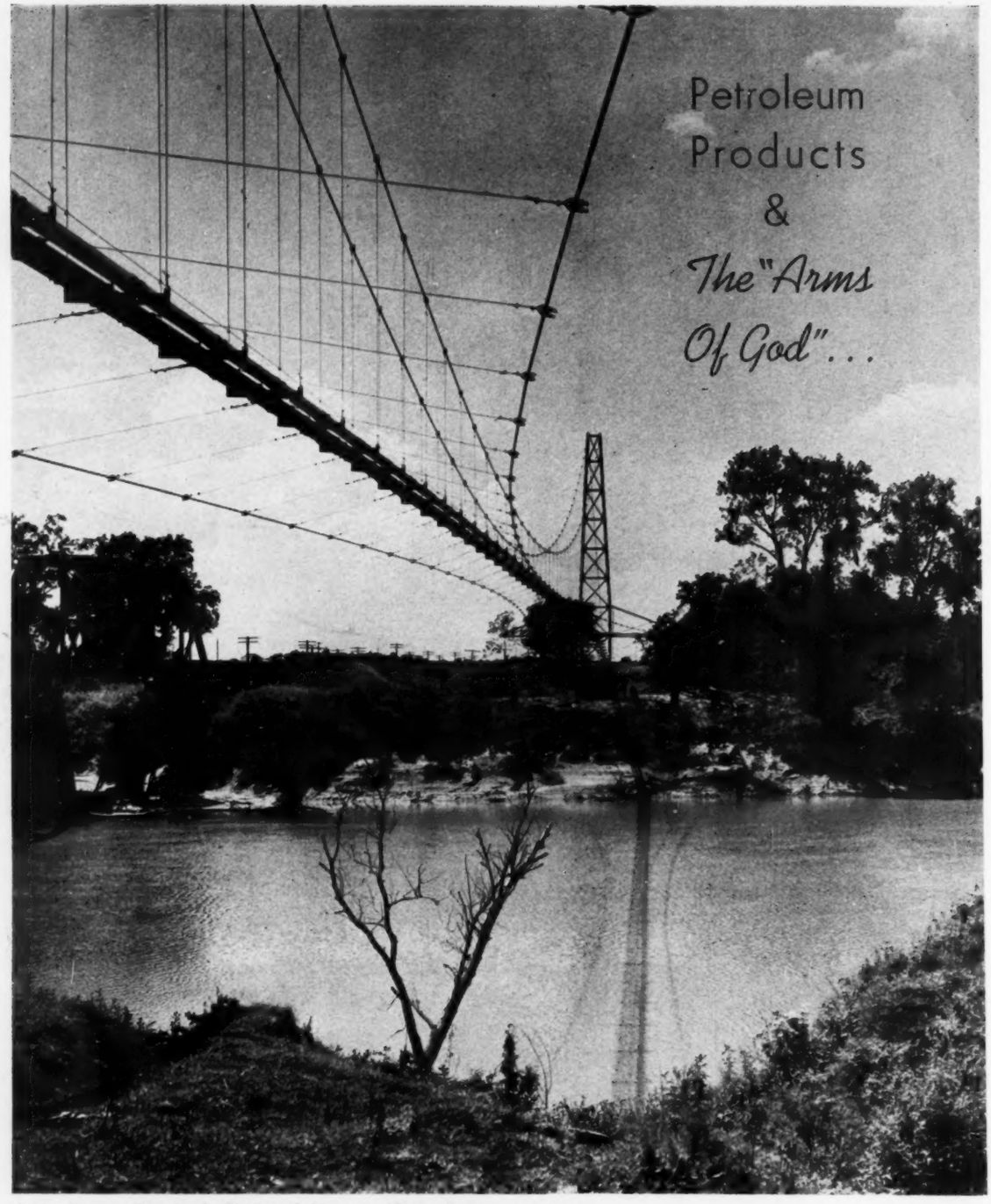

Legend says Spaniards fleeing Indians in Texas long ago were saved when a sudden flood in a stream they had just crossed stopped the savages. Thankfully, they named the protecting river the "Arms of God," in Spanish, "Brazos del Dios," now shortened to Brazos.

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WORLD PETROLEUM

Founded by Russell Palmer

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This Month's Cover

Gravity meter crew in Palmetto swamp along Intercoastal Waterway below Lafayette, La. Assistant holds blanket to shield dial for meter reader. Photo by Hakanson for Standard Oil Company (Ohio).

Continental to build small TCC unit at Denver

THIRD SMALL TCC LICENSED SINCE WAR WILL BE FIRST CAT-CRACKER IN COLORADO

As an important part of a $4,000,000 construction program to enlarge its Denver refinery, Continental Oil Company has contracted to build a new small T C C unit of 3,300 B/D fresh feed capacity. Engineering and design of the new unit are already under way and its completion is scheduled for early 1948.

Although the new unit will be the first cat-cracker to be built in Colorado, it will be Continental's fourth T C C, three others of larger capacity having been operating since early 1944 in the company's Ponca City refinery. Improved features of design and construction, which will be incorporated in the new unit, will provide a higher yield of motor fuel than any single catalytic cracking unit in existence.

Houdry will be glad to furnish to any refiner, a complete economic analysis to show exactly what T C C can do for his particular operation.

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EDITORIAL

OIL'S PLACE IN WORLD FUEL SUPPLY

IN seeking to revive the prostrate economy of Europe recognition has at length been given to the fundamental importance of fuel to the attainment of this objective. Lack of fuel not only involves discomfort and actual suffering to workers and home dwellers but it stifles industrial activity, strangles transportation and by preventing the general use of farm machinery delays the production of vitally needed food crops.

For the European continent fuel, historically and because of greater availability, means primarily coal. Therefore, effort is being concentrated on providing larger supplies of coal. To extricate Germany from the position of a permanent international mendicant the first step, it is now agreed, is to expand coal output in the Ruhr. The necessity is so urgent that it has led to joint action by British and American authorities to enlarge production with France prepared to join if supplies to meet her own needs are guaranteed. The No. 1 domestic problem of the British government is to bring more coal to the surface in order that the nation's manufacturers may turn out more goods for export. To accomplish this purpose drastic measures are contemplated, extending even to the threat of forced labor. In the meantime precious dollars have been sacrificed to supplement the short supply by imports of coal and oil from the United States. In Italy which has long been dependent upon imports of fuel desperate efforts have been underway to find new sources of supply with which to replace those cut off by post-war developments. Failure to obtain coal in anything like the quantity needed has led the government to provide in its program for the coming year for a fivefold increase over pre-war imports of fuel oil. This, in spite of the lack of foreign exchange.

While these are emergencies arising from the war the question of fuels, not only the quantitative supply but its most effective use, is one that raises problems for many industries and in all parts of the world. It is one of the big problems before the oil industry which must decide sooner or later how far it wants to go in converting its crude material into products for industrial use in comparison with other growing claims that are being made upon it.

Coal, as is well understood, was the real foundation of the industrial age which began with the development of the steam engine. It was the only convenient and efficient fuel for the production of steam which for more than a century was practically the only motive power employed by railways, factories and in other mechanical operations. So firmly established was its position that it was long accepted as a truism that the country with the largest and most accessible coal supply possessed a decided advantage in industrial development and commercial competition. Other agencies for providing heat and power, such as oil, electricity and natural or manufactured gas are comparatively recent developments.

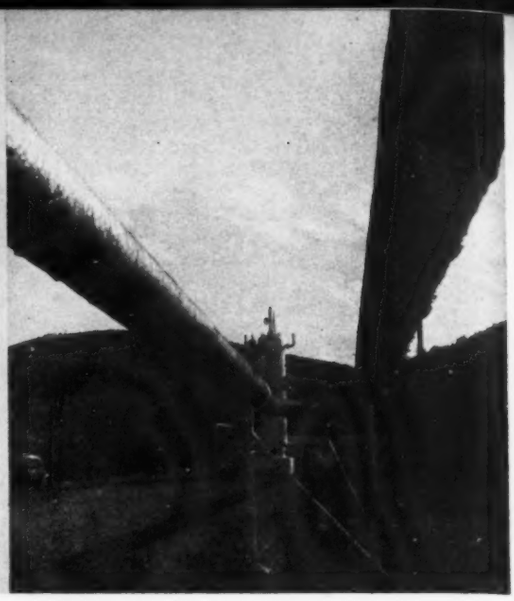
In the competition between coal and oil the two have moved on fairly even terms so far as price is concerned. This it must be admitted has been due in part to the fact that fuel oil has been treated as a by-product of refining and has been priced to meet the market rather than on the basis of its fair share in the cost of processing. This was necessary when no other use presented itself but with the introduction of new refining processes which permit fuel oil fractions to be converted into products which always have occupied a higher price range this condition has changed and there is no valid reason, particularly with the rapid growth in demand, why fuel oils should not pay their way on the same basis as gasoline.

Recent cost comparisons show that prior to the late war distillate fuel was selling on a virtual parity with anthracite coal and residual fuel oil was on practically an equivalent basis with bituminous. Since that time however anthracite coal has risen in cost by 48 per cent while No. 2 fuel oil has advanced only 22 per cent. The rise in the retail prices of bituminous coal was less abrupt but recent increases due to wage advances are putting it well above current quotations on residual. Of course the rise in favor of oil for domestic heating is not merely a matter of price but is influenced by considerations of comfort, cleanliness and dependability of supply.

Shortage of coal outside the United States is variously computed at 75 million to 150 million tons. It accounts in part for the heavy export demand for fuel oil and may be presumed to be a temporary condition. In any case oil cannot attempt to replace coal entirely as a source of heat and energy and there is no desire on the part of the industry to have it do so. It can be directed to selective uses for which it possesses definite advantages and that would seem to be a course preferable to flat price competition.

Loading a butane tank on a French dining car.

Laying the new gas line from Tarbes to Pau.



High pressure gas separator in St. Marcet field.

EXPLOITATION OF NATURAL GAS IN THE SOUTH OF FRANCE

By Henry M. Ballande

Henry M. Ballande

DRILLING is being done in southwestern France where, up to the present, crude oil has been obtained only in a very small quantity, some 20 barrels a day. With the exception of a short flow of gas from a well of the Societe des Petroles d'Aquitaine, which lasted scarcely more than a day, only the results obtained by the Regie Autonome des Petroles have been in any way notable.

During the first six month of 1947, that company drilled 17,800 feet in addition to the 204,500 feet drilled from the beginning of operations up to December 31, 1946. (See Fig. 1.)

The work in 1947 was distributed thus:

Month	Feet
January	3,750
February	3,140
March	3,140
April	3,720
May	4,050

These figures concern 12 wells, of which five were completed in March to May. One of these, Puymarin No. 1, on June 1 reached a depth of 12,000 feet which far exceeds the greatest depth heretofore attained in France.

It is recognized that the formations are generally hard and abrasive and resist rapid drilling, and on the whole drilling in the Petites Pyrenees presents conditions clearly more formidable than those encountered on the average in the great petroleum regions of the world, as for example in the United States.

Production is also limited by the scarcity of trained personnel by the general bad state of the equipment, and the insufficient stock of rotary bits available in France. Three-cone bits obtained from the United States are helping to relieve this situation. It is reasonable to expect that when more general use of American equipment is made and with improvement in the quality of tools built in France, the loss of time due to the scarcity of material, which recently amounted to 40 percent of total drilling time, will be reduced.

Production of gas continually increased during the first three months of this year and then slowed down due to seasonal decrease of demand. As in 1946, the supply came from six wells of Saint-Marcet; their output is shown in the following table:

	Gas in Million Cubic Ft.	Stabilized gasoline, metric tons	Butane in metric tons
January	445.6	556	86
February	446.5	621	88
March	460.8	682	118
April	405.2	592	132
May	416.9	632	104
Total	2,174.7	3,083	528

As is shown in Fig. 2, the prodution of gas has steadily increased since 1942. The increase in 1946 was 29.5 percent, in comparison with the preceding year; that of 1947 apparently will amount to 40 percent (against a previous estimate of 55 percent).

Most of the natural gasoline is stripped from the gas by cooling at a central stripping station installed in the St.-Marcet field, which has sometimes attained outputs about 17 million cubic feet per day. Improvements are in contemplation to raise production high enough to meet an expected demand for 25 million cubic feet in 1948.

A small proportion of the production still goes

to the old plant at Peyrouzet, which was built in 1942 and has a theoretical treating capacity not in excess of 10 million cubic feet a day. Besides stripping operations, this plant has facilities for stabilizing the crude gasoline obtained, either by itself or by the central station. The plant will recover approximately 50 percent of the propane and almost all of the butanes and heavier hydrocarbons present in the inlet gas. The gas, stripped of these hydrocarbons, will then flow through a dehydration plant for removal of water vapor and into the gas pipe line.

In the plant the desired hydrocarbons are removed from the gas by an absorption process employing a light gas oil as an absorption medium. The absorption oil flows over bubble columns countercurrent to the upward flowing gas. The hydrocarbons which are removed from the gas by the oil are subsequently stripped from the oil by further processing in the plant.

The crude gasoline condensed from hydrocarbons removed from the absorption oil flows through the fractionating portion of the plant where propane, butanes, motor fuel, kerosene, gas oil and fuel oil are produced as separate products. Facilities are provided in the plant for blending propane and butane for the production of "Bupro," a liquefied petroleum gas used for fuel. The plant will contain facilities for bottling the "Bupro." The plant will also provide facilities for blending tetraethyl lead with the motor fuel.

The plant uses a minimum amount of gas for its own operation. The primary source of energy will be electrical power purchased from hydroelectric plants in the vicinity of the gasoline plant. Equipment is provided in the plant, however, to generate power in case of failure of hydroelectric power. The yield of finished products (stabilized gasoline, butane and propane), amount to 90 percent of the total crude gasoline treated.

Toward the end of 1948 these provision installations will be replaced by a modern stripping plant for which the Hudson Engineering Corporation, of Houston, Texas, has the contract and whih will be erected at Boussens. Its treating capacity will reach 42 million cubic feet per day, with an operating pressure of 60 kilograms per square centimeter. The contractor guarantees a recovery of liquid products in excess of 100 grams per cubic meter of gas treated, which will be nearly double what is now being obtained.

Hudson Engineering Corporation has charge of all engineering studies, the procurement of American material, and the work of construction. Deliveries will cover the period from the middle of 1947 to the spring of 1948, and erection will require about a year.

Since January 1, 1947, distribution of the gas was provided by 136 miles of pipeline consisting of three divisions, Peyrouzet-Toulouse, Peyrouzet-Tarbes-Pau and Peyrouzet-St. Girous. On the date mentioned, three Clark motor superpressure compressors of 400 HP each were put in service at Peyrouzet; each of these compressors can deliver a pressure of 26 to 60 kilograms per square centimeter with an output of seven million cubic feet of gas per day. This installation enabled the capacity of the six-inch line to Toulouse to be raised to 14 million cubic feet per day which is three million more than was called for by the original design.

Gas leaks, which at one point required replacement of 500 yards of pipeline, have emphasized the importance of the struggle against electrolytic corrosion. This corrosion is certainly due to the proximity of electrified railroad lines, the rails of which to a considerable extent are parallel to the pipelines and which, due to defective electrical connections at the rail joints, offer greater resistance to the passage of the current than the welded pipes. The currents drained off by the pipes amount to as much as 100 amperes.

A detailed study of the situation of the pipeline system has shown that the only efficacious means of defense will be a general cathodic protection. A special system for this protection is being pro-

(Continued on page 78)

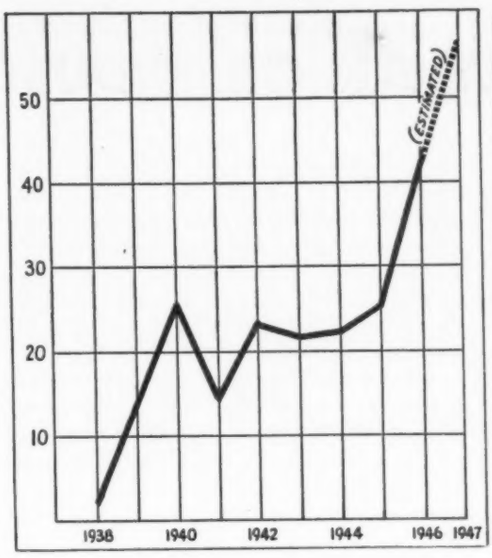


Fig. 1 Record of footage drilled in St. Marcet field.

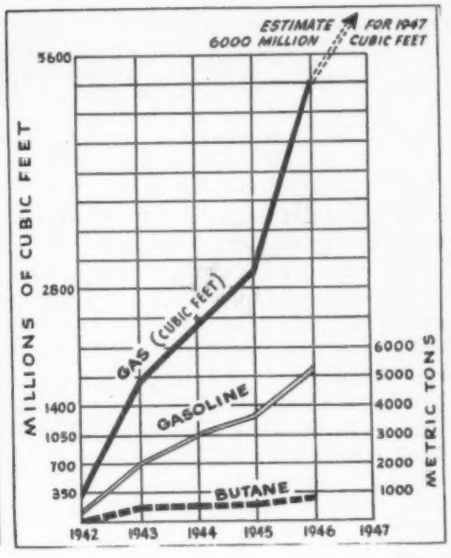


Fig. 2 Production of gas, natural gasoline and butane.

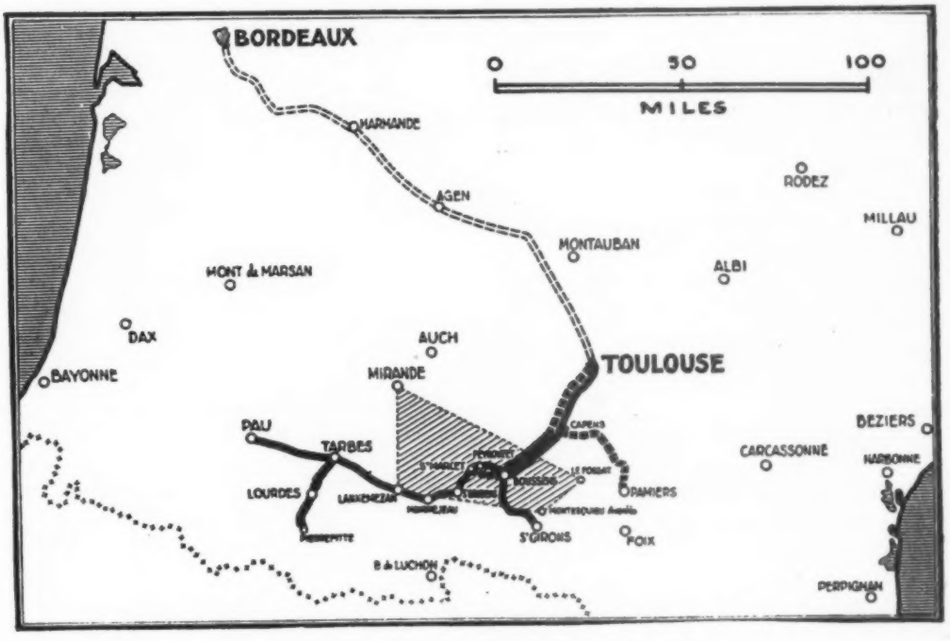


Fig. 3 Map of present and proposed gas pipeline system.

STEEL SUPPLY AN OIL INDUSTRY PROBLEM

T is a truism that the greater part of American manufacturing industry is based directly or indirectly upon steel and steel products. During the war the pressure for all kinds of steel to meet military requirements was tremendous, and much plant equipment was badly run down and in need of replacement by the end of the struggle. Counting, as did so many industrialists, upon a temporary let-down in demand during this period of reconversion, the fabricators of steel adopted plans of rehabilitation that, upon completion, would lead to increased production but for the time being resulted in lowered capacity. To cope with rising costs of production, they dismantled some of the more expensive and outmoded processing installations in order to replace them with improved equipment that was more efficient and economical. The capacity for pipe and tubing for example, which was rated by the American Iron and Steel Institute at 8,500,000 tons in 1944 had been reduced to 7,650,000 tons by the end of 1946 in this process of readjustment.

There is a close parallel between the postwar course of petroleum and steel, and, of course, their experience was matched by that of many other industries. Based on the abrupt drop in war requirements with the close of hostilities, the opinion of the majority of members of the oil industry, both economists and operating men, was that demand for their products would recede to about the level of 1941, at least during the period of reconversion to peacetime operation. Actually their chief worry was that production might be in excess of the market's ability to absorb.

There has been some ill-informed criticism of the steel industry because it did not anticipate the heavy postwar demand and proceed more rapidly to enlarge its facilities. In reality the industry, having pushed production to the limit between 1941 and 1945 to meet war requirements, had every reason to anticipate after V-J day a considerable slackening of pressure which in fact was experienced during the latter part of 1945. The industry had carefully prepared plans for plant rehabilitation and the addition of new capacity, but the execution of these plans was delayed by the same causes that affected other lines of business—inability to obtain basic materials and various kinds of essential equipment such as electric motors, presses and other machines. The fitting out of an iron foundry or a steel mill, requiring as it does many installations that have to be built to individual specifications, presents difficulties not encountered in some other forms of manufacturing.

In 1946, moreover, the steel industry was unfortunate in undergoing a series of strikes and in having some of its plants shut down at different times by work stoppage in the coal mines and by a shortage of gas in the winter. Despite these handicaps, however, it was possible to produce five million tons of pipe and tubing, an output larger than had been attained in any year prior to World War II. Production of this class of goods from 1931 to 1946 has been as follows, according to the records of the American Iron and Steel Institute:

Year	Tons
1931	2,059,421
1932	1,107,542
1933	1,588,353
1934	2,045,887
1935	2,276,544
1936	3,643,779
1937	4,282,584
1938	2,580,463
1939	3,764,272
1940	4,272,684
1941	5,736,906
1942	5,283,844
1943	6,219,345
1944	6,406,423
1945	6,030,243
1946	5,000,000

As appears from the above, the average outturn for the six years 1931-36 was 2,120,254 tons. For the four prewar years 1937-40 it increased to 3,725,000, and during the war period 1941-45 it rose to 4,735,000 tons with a peak of 6,400,000 tons in 1944. For the first six months of 1947 a gradual increase has taken place as shown by the following figures from reporting mills:

Month	Tons
January	460,837
February	478,477
March	502,059
April	518,488
May	535,254
June	527,014

The figures for the first half of the year point to an output for the twelve months of 1947 of something over six million or close to the top record of the war period. The slight decrease in June as compared with the preceding month is accounted for by the fact that it contained one less day, the daily average being slightly higher in June.

This rate of production, of course, has not kept pace with the extraordinary increase in demand from the oil and other industries. Under ordinary conditions between nine and ten percent of the hot rolled iron and steel produced in the United States has consisted of pipe, and this percentage has remained fairly consistent for the past quarter century, which is as long as records are available. Of the total volume of pipe and tubing, line pipe constituted roundly 16 percent or about 800,000 tons out of a 5,000,000-ton production. By far the greater part of this was pipe of 12-inch diameter or less. Pipe of 26-inch diameter or larger comprised less than two percent. During 1946, however, orders for pipe in these large sizes amounted to more than a million tons or 20 times the average of the preceding five years. Demand for refinery pipe and tubing and for oil country goods, which in trade parlance means drill pipe, casing and tubing, was seven times the prewar yearly production.

These unprecedented demands, together with a big upswing in the requirements of automotive manufacturers, the railroads, agricultural and industrial machinery, the building trades and other industries, were far beyond any possible increase in capacity on the part of steel fabricators. The only logical recourse of the manufacturers was to allocate deliveries to their customers on a percentage basis of previous purchases, and this was the plan adopted by practically all of the larger companies. At the present time these manufacturers almost without exception are booked to capacity up to the end of 1949 or longer.

One phase of the situation that has been the cause of grave concern to iron and steel manufacturers and has hampered their operations has been the scarcity of scrap metal. Testifying in July last before the Senate Small Business Committee of which Senator Edward Marin of Pennsylvania, was chairman, Walter S. Tower, president of the American Iron and Steel Institute stated that approximately seven million tons of the country's rated steel-making capacity was idle due to various reasons. One of the principal causes, he pointed out, was the inadequate supply of scrap. Units in service were not obtaining their full potential capacity because much of the scrap available was of light weight, giving a relatively small yield.

The importance of scrap to the operations of the iron and steel industry is indicated by the fact that it is relied upon to supply nearly half the metal entering into the manufacture of finished products. The steel mills of the country have a rated capacity of 92 million tons of ingots from

which products are rolled. Steel and iron foundries have an added capacity of 16 million tons. Allowing for conversion losses, the total tonnage required for this volume of production is 119 million tons of metal. These statistics were presented to the Martin committee by Robert W. Wolcott, chairman of the Steel, Foundry and Scrap Industries Committee for Expediting Iron and Steel Scrap.

Of the total metallic requirements, blast furnaces provide 66 million tons in terms of rated capacity. Of the remaining 53 millions tons, the steel industry supplies approximately one-half in the form of so-called home scrap collected from the mills and foundries. The balance, some 26,500,000 tons, consists of purchased or open market scrap made up mainly of discarded vehicles, machinery and miscellaneous objects.

During the war when steel production was breaking all past records, the country was scoured for materials of this kind in the several drives put on for the purpose, and practically everything available was used up. In the ten years ending with 1940 some 20 million tons of scrap was exported. During the war itself, it is estimated that 140 million tons of potential future scrap was lost in combat, abandoned abroad or disposed of to other countries as surplus military supplies.

Aside from the problem of scrap supply, which is expected to be a continuing one for the next ten years due to the near exhaustion of a long-accumulating supply combined with increasing requirements as production grows, there are numerous other obstacles to the enlargement of output which were explained to the Martin committee during the hearings in September by prominent members of the industry. Expansion of steel production is not merely a matter of adding units to existing plants. It involves the development of added sources of raw materials, new ore mines, sinter plants, open hearth furnaces, blooming mills and finishing mills.

Exemplifying this general condition by reference to the situation of his own company, Chairman T. M. Girdler of Republic Steel Corporation told the Martin committee:

"Increasing the nation's steel capacity by 10,000,000 net tons would require the diversion of 1,500,000 tons of finished steel from present production to build new furnaces, mills and other facilities. Republic's share of the increase in capacity would be 1,000,000 tons and would probably cost over $200,000,000. It would be at least two years before we could produce any additional tonnage, and it is my opinion that by that time the present excessive demand for steel will have been met.

"Under today's high construction costs, the capitalization required to increase Republic's capacity by 1,000,000 tons would force the price of steel produced by the new facilities from $15 to $20 a ton higher than the present to avoid a loss.

"Recently our company completed a study of long-time trends in the major steel-consuming industries. This study shows conclusively that when the present temporary boom has passed, demand for many of the products of these industries will either resume prewar levels or will enter a period of gradual decline. In item after item now being manufactured, the peak demand has passed and a return to normal levels is fast approaching. Suppose steel to build 10,000,000 automobiles in 1948, and a like number in 1949, could be provided? How many would be needed in 1950 with 20,000,000 virtually new automobiles on the road? We learned during and since the war that a car would last several years longer than previously considered possible. With the older cars which would be on the road we would have one automobile for nearly every family in the United States.

The steel industry neverthless is carrying out extensive plans for new construction and improvement of methods that will largely increase production once they are completed. On this phase of the situation, Walter S. Tower, president of the American Iron and Steel Institute, made the following statement on September 11:

"Steel companies are completing this year large-scale postwar programs of expansion and improvements involving record-breaking peacetime expenditures totaling more than $1,000,000,000. Plans for the further increase of facilities now contemplated will require additional expenditures of several hundred million dollars.

"Listed for completion in 1947 and 1948 are the addition of 2,500,000 tons of new ingot-making capacity; nearly 3,000,000 tons of new coke oven facilities; 3,000,000 tons of new blast furnace capacity; and 3,000,000 tons of new sheet and strip capacity are also under construction. Substantial increases in capacity for finished products in addition to sheet and strip are also being made. The steel companies' expansion and improvement programs have been in various stages of development for months, some projects having been started as long as two years ago. This important program of expansion, together with record-breaking peacetime steel production this year, is the best answer to statements that steel companies are holding back both production and expansion.

"The current tightness in the market for steel has resulted from various abnormal conditions, including the loss of 18,000,000 tons of steel ingots from strikes since the end of the war, more than 10 percent of actual output during the period. If this lost tonnage had been available, it is a safe assertion that there would be few complaints about steel shortages today.

"During the first eight months of 1947 the production of steel ingots was 56,000,000 tons. This was at the annual rate of 85,000,000 tons, the highest for any peacetime year in history and 60 percent above the output of 53,000,000 tons in 1939, the last peacetime year. The production of flat rolled products used by makers of automobiles, refrigerators and similar products, was up 79 percent this year compared with 1939. Existing capacity of 91,241,000 tons of ingots compares with 62,314,000 tons in 1920, two years after the close of World War I. This is an increase of 46 percent compared with an increase of 35 percent in the country's population.

"In the past the industry has been accused of over-expansion, but never before in peacetime has it been accused of under expansion. As late as 1940 prominent labor leaders, government economists, members of the Temporary National Economic Committee and others were complaining that the steel industry was contributing dangerously to technological unemployment through excessive modernization of equipment.

"Analysis of all the facts clearly shows that where there are steel shortages, they are largely due to abnormal conditions. Some of the most important of these are:

"(1) Since the end of the war there have been two concurrent kinds of demand for steel, one to supply the unprecedented demand for goods caused by the sharp curtailment of civilian production during the war, and the other to fill up war-depleted inventories. Obviously the second kind of demand has been unusual and will taper off when normal inventories are restored.

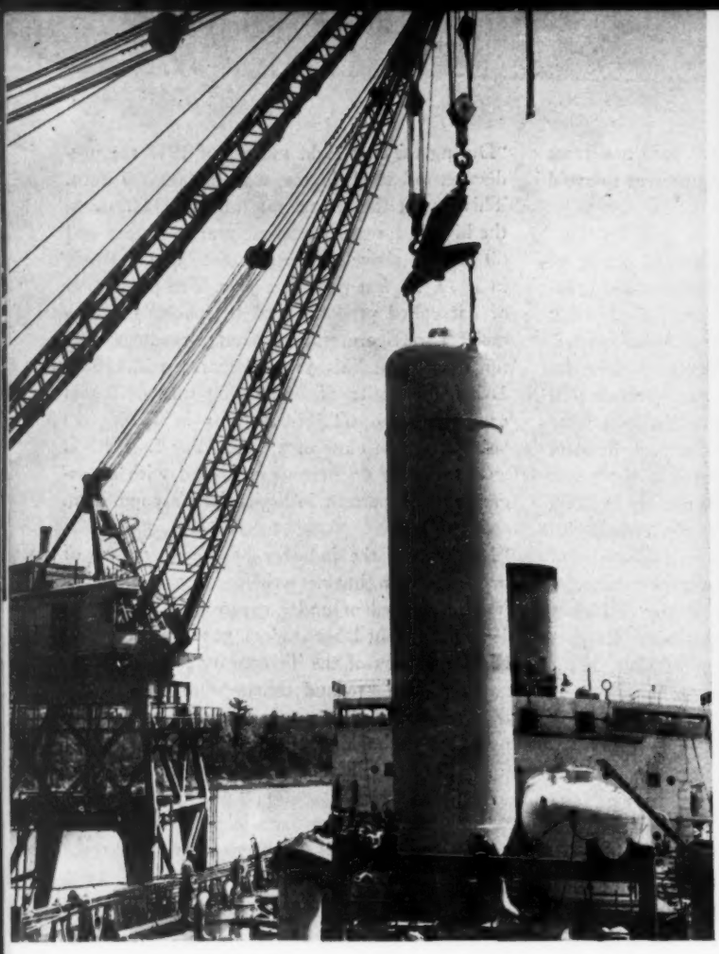
"(2) In the 24 months since the fall of Japan, the steel industry has lost 18,000,000 tons of steel ingots through strikes in steel and coal.

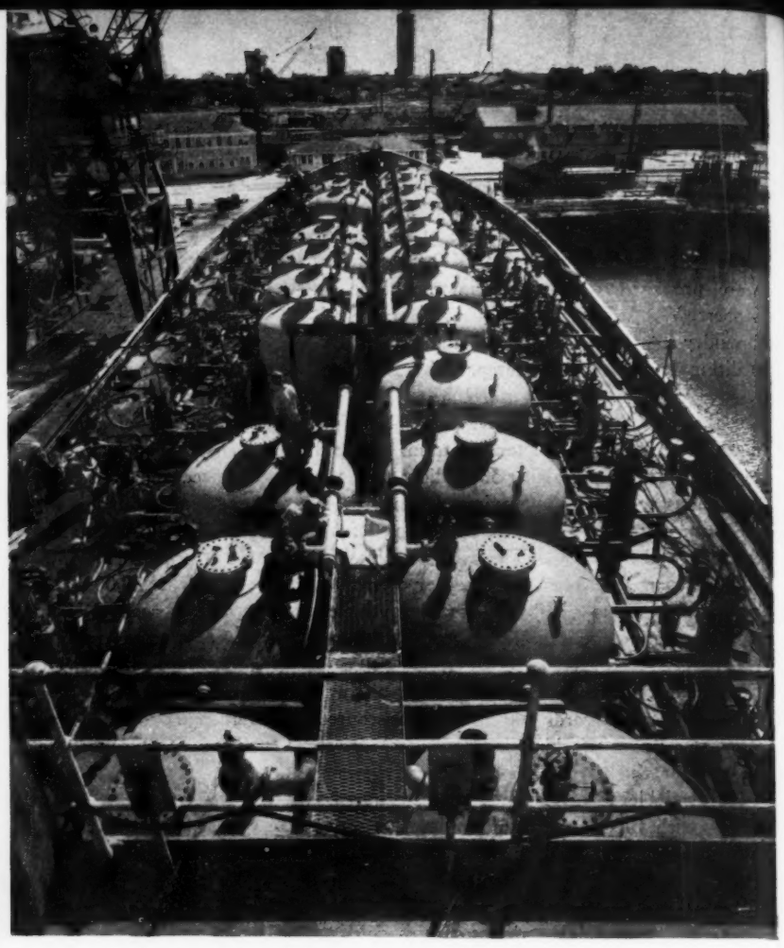
"(3) Strikes and delays in industries supplying machinery for the steel industry have hampered improvements and expansion plans in the industry. For example, 3,000,000 additional tons of sheet and strip capacity over July, 1941, was planned to be in operation on June 1, 1947. But only 1,000,000 tons of that increase was completed on schedule through inability to get necessary equipment.

"Steel company shipments of steel for export this year have amounted to about seven percent of total shipments. This is no greater percentage than in prewar years. A substantial amount of the steel exported has been in accordance with government directives. Although heavy demand for American steel to reconstruct Western Europe may be necessary for the immediate future, the dependence on the United States for steel will lessen as European steel production rises.

"At the present time production of ingots is running at the annual rate of about 6,000,000

(Continued on page 84)





LPG TANKSHIP HAS ELABORATE SAFETY EQUIPMENT

FIRST ocean-going tank ship designed for the sole purpose of transporting propane and other liquefied petroleum gases has been completed for Warren Petroleum Corporation of Tulsa, Oklahoma.

The vessel, christened the "Natalie O. Warren" in honor of President W. K. Warren's wife, is a converted C1A dry cargon ship constructed in 1943 at Wilmington, Delaware, and purchased from the U. S. Maritime Commission in July, 1946. The conversion to a tank ship was handled by Pennsylvania Shipyards, Inc., at Beaumont, Texas.

The ship is turbine-propelled by a single screw and is of the shelter deck type with a raked stem and a cruiser stern. Her length over all is 412 feet, and her beam 60 feet. Her draft at load displacement is 23 feet, 6¾ inches, and displacement at that draft is 11,085 tons.

The turbine is a double-reduction geared unit normally developing 400 shp at 90 revolutions per minute. The steam plant is composed of two marine-type oil-fired boilers.

With her speed of 14 knots the tankship is expected to make t vo round trips per month between Gulf Coast and Atlantic Coast ports. In order to obtain maximum service from the vessel, Warren Petroleum Corporation has enlarged its Norsworthy (Houston) terminal sufficiently to permit the assemblage and storing of 60,000 barrels of liquefied petroleum gases.

The corporation also will complete shortly an eastern terminal at Newark, N. J., equipped with 70 tanks of 30,000 gallons capacity each or a total of 50,000 barrels. This terminal will have adequate tankcar loading facilities so that the product received by tankship can be reshipped by tanker to various destinations in the eastern states.

More than 18 months were spent on design before the ship was moved to the shipyards on June 1 when actual conversion work was started. The ship was christened October 11 with appropriate ceremonies at Beaumont.

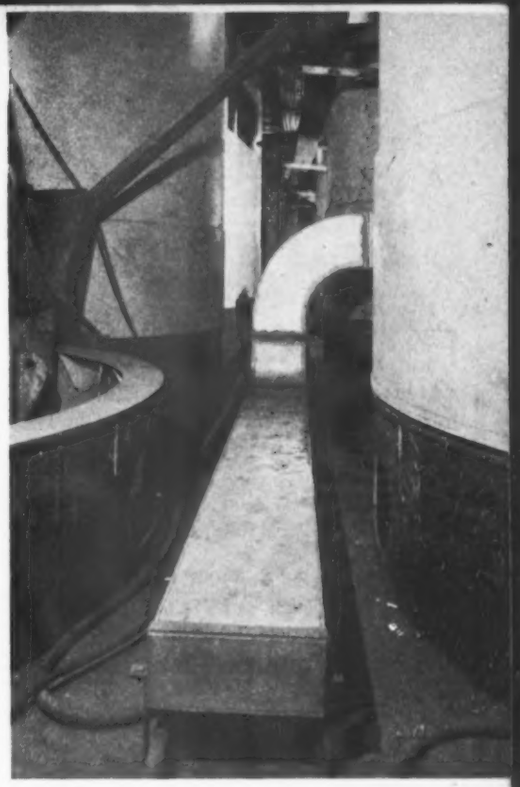
It was realized that the type of ship the corporation desired presented numerous design problems and that it would conflict with some existing regulations. After carefully weighing the problems involved in the construction of a new vessel as compared with the conversion of some existing ship to specific requirements, it was decided to acquire the dry cargo vessel and undertake the conversion in accordance with selected plans.

After the ship was purchased, it was allowed to remain in charter service for almost a year while numerous conferences were held with the United States Coast Guard, the American Bureau of Shipping, a sub-committee of the American Petroleum Institute's tanker committee and patent lawyers and the U. S. Patent Office, so there would be incorporated in the tankship such nautical and safety features as to make her the "safest tank ship afloat."

Extreme Left: One of the 48 foot inboard tanks, which will extend aboue the deck approximately 4 feet, is in position for lowering into its well.

Left: View looking forward from the bridge, showing all the tanks except one in place. Catwalk is being installed between the inboard row of tanks. Manholes for the two outboard rows of tanks, with connections, can be seen.

Right: View taken crosswise of the ship showing one of the ventilating ducts as well as the foundations for the tanks. The type of foundation is clearly shown at the left foreground.



The design adopted called for the installation of sixty-eight huge steel tanks, each of sufficient wall thickness to withstand pressures in excess of 250 pounds per square inch. The tanks were fabricated to various sizes in order to utilize the maximum amount of space available in each of the ship's five holds.

The smallest of the tanks is eight feet inside diameter, while the largest are 12 feet 9 inches inside diameter. They vary in length from 17 feet 5¾ inches to 48 feet, and are constructed of A-212, 70,000-pound high tensile strength steel. The larger tanks were stress relieved and X-rayed. The wall thicknesses of the tanks range from slightly less than one inch up to 1⅜ inches.

There are four rows of tanks extending the length of the ship. The two outboard rows are below the top deck and, in order to keep all connections and fittings above deck, it was necessary to fit each of these 31 tanks with long 24-inch "necks" or manholes which extend through the deck. The two inboard rows of tanks, totaling 37, extend through the deck and above it to heights ranging from five to 14 feet.

Before the 68 tanks could be placed and anchored in their vertical positions in the ship, it was necessary to remove all cargo handling equipment and the two masts, as well as to cut the deck house in two so a portion of it could be set to one side. It was also necessary to remove virtually all of the top deck and to install girder and "collar" supports and to install the circular foundations to which skirts, welded to the tanks, were to be bolted. These foundations are 18 inches in height, permitting easy inspection of the tanks' bottoms.

After this preparatory work was completed, the tanks were lifted by ship's crane and slipped into their respective "wells" and bolted to their foundations. To prevent any undue strain on the tanks in picking them up to a vertical position, they first were lifted in a horizontal position with two cable slings around them so that the weight would be evenly distributed and lowered into the water. From the water they were carefully lifted by cranes into a vertical position and swung into place and then lowered.

In order to allow for expansion and contraction and movement of the ship, the inboard tanks are supported by a system of wedges at the main deck and first deck so that the tanks can expand or contract in a vertical direction. The outboard tanks are wedged below the main deck as the manholes project through the deck.

It was deemed advisable to maintain the watertight integrity of each hold. The tanks accordingly were equipped with expansion sealing joints at points where either the tanks or the "necks" project through the deck. Not only will these joints keep sea water out, but they also will prevent any propane from entering the holds from above-deck in the event of a pipeline failure.

With all fittings, connections and piping above deck and the holds watertight, there is virtually no possibility of propane, either in liquid or gaseous form, getting below decks. An extra margin of safety has been provided, however, by the installation of a complete ventilating system with ducts leading to the very bottom of the ship. This system is capable of changing the air entirely every 30 minutes and accordingly would quickly remove any gases which might get into the holds.

A complete combustible gas detector system also has been installed. It will sound an alarm if a gas-air mixture anywhere in the ship reaches only 40 percent of the lower explosive limit. A complete carbon dioxide system, capable of instantly flooding any hold or the engine room has been installed, and the ship's original smoke detecting equipment has been reinstalled.

Each of the tanks has been equipped with an over-sized pressure-relief valve which feeds into a large header which, in turn, feeds into one of the specially constructed hollow masts. Vapors escaping in the event one or more of the pressure-relief valves "popped" thus would be vented to the air 60 feet above the ship's deck.

With all of the connections and piping above deck, expansion joints and pipe bends have been installed to allow for movement of the tanks and for normal expansion and contraction without rupture to the piping. The tank openings for gauging, pressure gauging and sampling connections are protected by excess flow valves which close automatically in the event of line breakage. The discharge and gas pressure connections are protected with a new type hydraulic internal valve which is always closed unless manually opened by operating a small hydraulic pump at each tank. These pumps are operated in turn by air control valves and are so installed that the two valves on each of the 68 tanks may be closed simultaneously by operating one of nine air control valves located at strategic points of the ship. The air control system also protects the main discharge header and can be closed immediately. Thus, all the valves on the tanks can be closed instantaneously by one man operating only one air control valve.

For cargo handling purposes six 500 to 800 gpm turbine driven centrifugal pumps have been installed on the deck, together with a 1300 hp turbine driven centrifugal compressor and a 100 hp rotary compressor.

Since the tanks are in a vertical position below the decks and all pumps and piping are on deck, the only practical way to get the liquid propane to the pumps is by applying a slight pressure to the vapor space of the tanks, which forces the liquid through dip tubes into the pump suction headers. For this purpose either the large or the small compressor can be used. To avoid vapor locking the pumps a special control mechanism has been installed at each tank which automatically closes the internal valves when the tank is empty.

The large compressor also will be used to evacuate the condensers. It is calculated that, in the summer time particularly, approximately 1,500 barrels of cargo can be recovered by withdrawing the vapors from the emptied tanks, condensing it and then pumping the liquid to shore tanks.

Another feature of the ship is the fact that during loading and discharging of cargo the entire operation functions as a closed system, and there accordingly is no possibility of gas or liquid escaping.

Present plans call for the ship to operate between the Gulf Coast terminal at Houston and the Newark terminal in the East Coast, or any other East Coast terminals capable of receiving as much as one-third to one-half of the ship's cargo.

GERMANY'S OIL INDUSTRY TODAY

FROM a global standpoint the present German oil industry and trade are so small that they make only a microscopic contribution to world statistics. The total production in 1946 was 642,438 tons, which was supplemented by imports valued at $7,034,000. These are small figures, but they loom large in the present German economy.

During the first half of 1947 the total domestic crude oil production was 274,602 tons, and at that rate it seems doubtful if the final figures for this year will come up to those of last year. There are now 23 active oil fields. Their production in May is reported as 50,948 metric tons and for June 49,599 tons.

In the face of a great scarcity of material and lack of even the simplest spare parts, drilling work in April and May passed the 10,000-meter mark for the first time since the surrender. In the previous February only 1,756 meters were drilled. The drilling in May and June is classified as follows:

	May (Meters)	June (Meters)
Exploratory drilling with government aid	214	205
Exploratory drilling without government aid	3,171	3,331
Deepening	1,093	1,123
New wells in old fields.	6,005	3,938
Totals	10,483	8,597

Total meterage drilled in the first half of 1947 was 42,581. At the rate of the last two months it is expected that drilling in 1947 will exceed the 79,676 meters drilled in 1946. More than half the new meterage in May and June was exploratory. So far, however, the spurt in drilling has not been followed by any great increase in production. An important reason for the low state of production and also of drilling is the scarcity of equipment and materials. The normal steel requirement of the operating oil companies is 19,000 tons per quarter-year, but in the first quarter of 1947 the steel delivered to all the fields was only 1,550 tons.

The newest German oil find is the Adorf field which lies northwest of Lingen between the Dutch border and the river Ems. The discovery well, Adorf 1, Preussag, was completed in October, 1946, at a depth of 1240-1340 meters in the Wealden sandstone (Lower Cretaceous). Another well is now on the way. The first well has proved a reserve of 50,000 tons, and total reserves of the new field are estimated at 950,000 tons. Additional drilling in this field is hampered by the steel shortage, and for the same reason no production has yet been obtained.

Discovery of the Adorf field has accentuated tension in the Dutch-German boundary dispute. The Dutch claim would extend the border so as to deprive Germany of the Emsland district which contains a proved reserve of 3.8 million tons and in addition a probable reserve of four million tons. This question is naturally of great concern to the Germans. The Dutch press is arguing that Emsland oil is really a bagatelle, but the Germans say that the district contains three-fourths of their entire oil reserves and that, though Emsland oil is small in quantity, its loss would be a hard blow to the German oil economy, which would then have only the old Hanover district at its disposal. The Emsland fields now offer the only visible source from which German oil production might be increased and are the only hope of making a dent in the estimated requirement of $50 million of foreign credit to obtain oil imports sufficient to meet the requirements of the 1947-48 plan for the Bi Zone.

The Bentheim natural gas field which shortly after the beginning of World War II was discovered at 1600-1700 meters in the Platten dolomite (Zechstein) near the Dutch border has lately lost some of its current importance. In 1945 71 million cubic meters of gas were produced; in 1946, 106 million cubic meters. At the present time three wells in the Bentheim district are producing six million cubic meters per month. Production has now been throttled because the engineers feared that the previous rate of withdrawal would damage the reservoir. The gas reserves of the Bentheim field are estimated at 4.5 billion cubic meters. The gas is carried through an 80-kilometer pipeline to the Bunawerk Huls near Marl.

Other sources of natural gas are provided by oil wells in the Reitbrock, Nienhagen, Steimbke-Rodewald, Wesendorf and Heide fields. Gas from these sources serves for local power production. Compared with the new Bentheim gas field, the combined production of all these sources is small, amounting in May of this year to only 540,000 cubic meters. Altogether the production of natural gas during the first five months of this year amounted to 36,048,400 cubic meters.

Among the immediate needs of the German oil economy is to accelerate restoration of German oil refineries to a point where they can make greater use of imported crude oil which is now flowing to Europe in increased quantities from the Arabian fields. As it now is, most of the oil imported into Germany is in the form of gasoline and fuel oil. There is enough unused refinery capacity in Hamburg and Bremen to reduce the expense of these imports, if only the Allied powers would arrange for the importation of crude oil, particularly as this would allow increasing production of high-grade lubricants. This matter is being considered by the occupation authorities as a means of economizing credits.

The low rate of production of coal is having an effect on the oil economy. The German oil industry received a theoretical allotment of 53,000 tons of coal to cover its needs for operating fuel during the three months of March, April and May but received only 33,000 tons and was forced to burn 8,000 tons of oil a month—oil which could have been turned into lubricants.

Lately the press has published a number of fantastic stories relating to oil discoveries. The Deutsche Vacuum Oil A. G. was said to have made a find in Lauenburg, but this rumor had no basis in fact. Another rumor had it that a 100-kilometer pipeline from Emsland to Hamburg was being planned; the only pipeline project now known to be under consideration is a four-kilometer gathering line for the Wintershall A. G. to connect its Emlichheim field to the nearest railroad station.

The organization of the oil industry in western Germany is in a state of flux and has not yet been put on a complete national footing. The German authorities have established a Mineral Oil Division of the Economic Administration (VAW) to handle oil matters with the American and British military administration. The function of the VAW is to oversee production, refining and distribution of native production, and of imports to the various districts and principal consumers on a quota basis. The Reichsamt für Bodenforschung (geological survey) has assumed active direction of exploration for oil while leaving considerable room for private enterprise.

A new organization, the Mineraloelwirtschaftsverband, e.V., has been formed to represent the larger importers, producers and distributors. To look after the interests of the smaller independent concerns specializing in the lubricating and fuel oil trade, the Mineraloel Zentralverband has been formed. An independent organization of wholesalers, the "Uniti" Vereinigung, has been established for the Hamburg-Hanover region. The Verband Schmierfett-Industrie of Hamburg includes only firms specializing in lubricants. The Arbeitsgemeinschaften der Deutschen Mineraloelindustrie, formed during the war, has been revived for the special purpose of supervising the storage of finished products. Other and still more specialized trade organizations have been formed for the distributors of particular products—gasoline, diesel oil, lamp oil and tractor fuel.

SHELL'S ELECTRIC DEHYDRATION PLANT

LARGEST electric dehydration plant in the world is Shell's Petreco emulsion treating plant at Lagunillas on the east shore of Lake Maracaibo. Briefly, the process accomplishes by electricity the separation of the water from the emulsion piped in from Shell's "wet wells" in that area. The emulsion is injected into a field of high potential alternating current of 33,000 volts, 60 cycles. Here the surface tension of the water particles is reduced, thus facilitating the coalescence and settling out of the water particles.

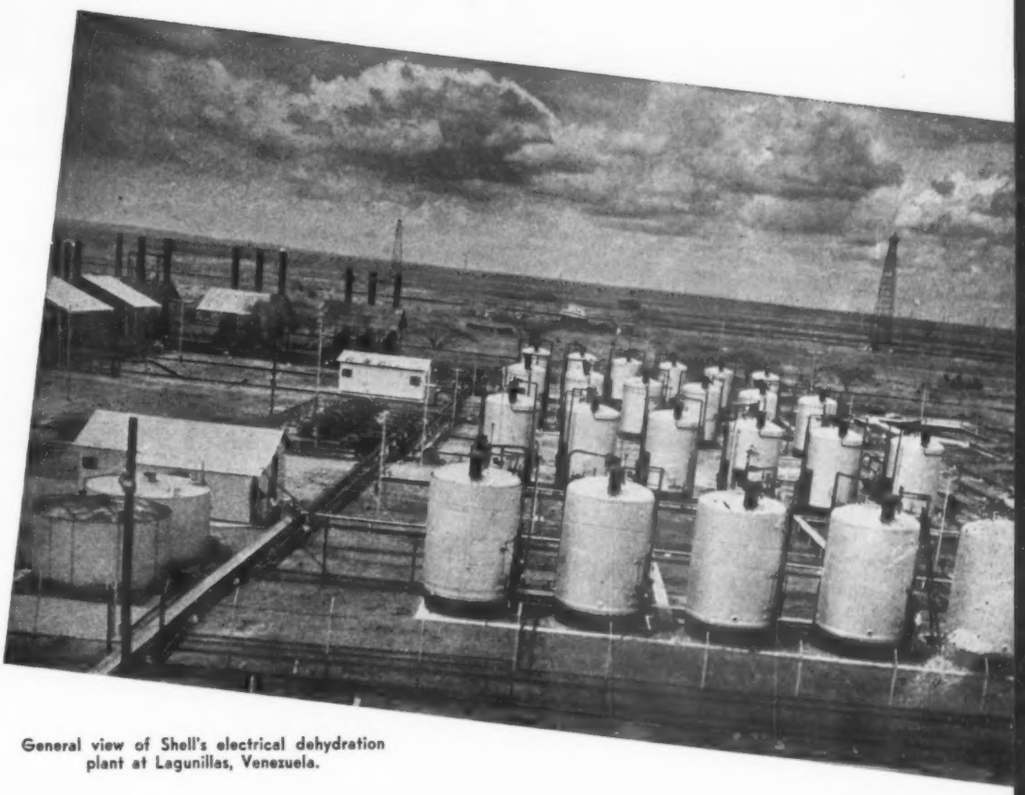
The oil arrives at the plant up to 35 percent emulsified. The wet gathering system has approximately 300 producing wells and 40 block stations. Total length of all lines is about 70 kilometers, not including the flow lines. Line sizes vary from four to twelve inches.

The 24 units in the dehydration plant are the standard type Petreco dehydrators, 10 feet in diameter and approximately 15 feet in height. These are equipped with a double transformer consisting of two 5KVA units with a voltage of 16,500, and using 50 to 60 cycle alternating current. Each dehydrator is provided with electrodes and automatic water level controllers.

The wet oil from the field is received at the plant in a balance tank with a capacity of 65,000 barrels. Seven electrically-driven pumps move it on to the 13 boiler heaters used for raising the temperature of the emulsion from 90 to 165 degrees Fahrenheit. From there the emulsion goes into the 24 standard Petreco dehydrators which are in four rows of six tanks. From the dehydrators the water is carried off into a skimming pit for separating still more oil from the water, while the oil goes on through back pressure regulators into a 65,000-barrel storage tank.

Average temperature maintained throughout the process varies from 160 to 170 degrees Fahrenheit. Daily plant capacity is 6,000 cubic meters net oil. Average specific gravity is 0.960 at 60°F. The output cut is from 1.8 percent to 2 percent as compared with the input cut of from 30 to 40 percent emulsion.

First 12 units of the plant were built in 1935; an additional four were built four years later in 1939; two more were added in 1941, four in 1943, and two in 1945. The plant was designed and built by Shell engineers. The plant area is 135 x 108 meters. Shell's total capital plant investment comes to 1,130,000 bolivares, which in U. S. dollars is approximately $339,000.



General view of Shell's electrical dehydration plant at Lagunillas, Venezuela.

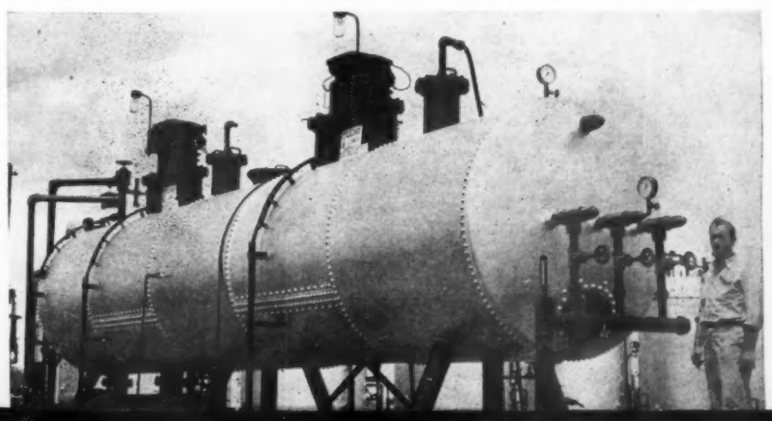
The plant is operated on a 24-hour basis by a minimum of manpower. A foreman in charge of the plant is directly responsible to the production superintendent. Under this foreman are one first-class shift operator, one second-class shift operator and one helper, on each of the three daily shifts.

Innovations in the plant include electrodes of a novel design giving high throughput and low output cut; automatic water level controllers for maintaining a constant water level in the dehydrators, and automatic temperature controllers on the boiler heaters.

Boiler heaters now in use are old boilers taken from drilling rigs with 75 hp and a present working pressure of 50 psi with a temperature of 165°F. These will shortly be replaced by Coalinga heaters.

Present plant production represents 40 percent of crude oil production in the Lagunillas field. Shell also has smaller electrical dehydration plants operating in the Mene Grande field and in the Los Manueles and Casigua fields of the Colon district.

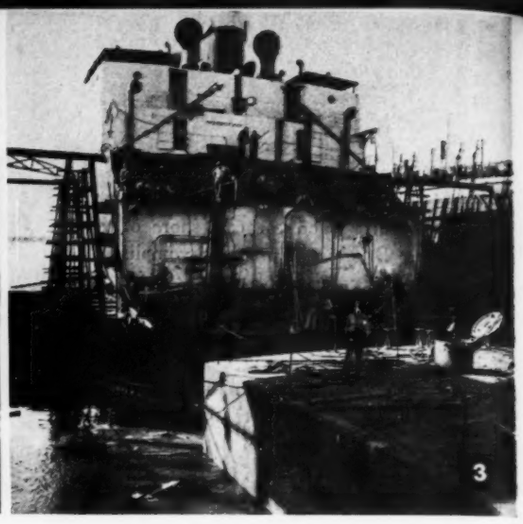
Horizontal dehydration unit.



Skimming pit for waste water from dehydration plant.

The Avila is dry-docked at the Sun shipyards, Chester, Pa.

2. Propane burning torches were used to cut out and scrap the old center section.



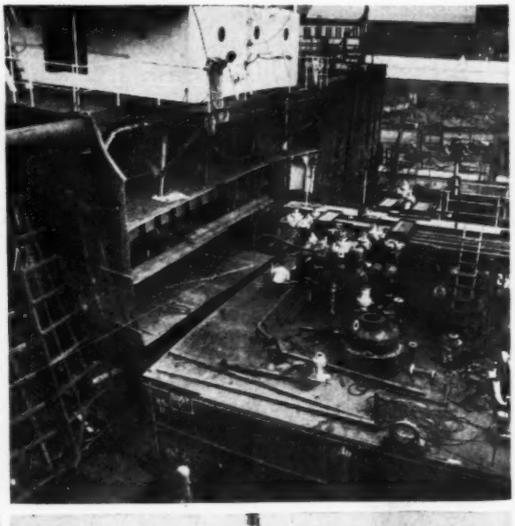
3. Stern section is towed away in part of the dry dock.

PROPANE TANKER CONSTRUCTION

Old midsection ready for cutting from the bow and scrapping.

5. New center section equipped with propane tanks is towed in.

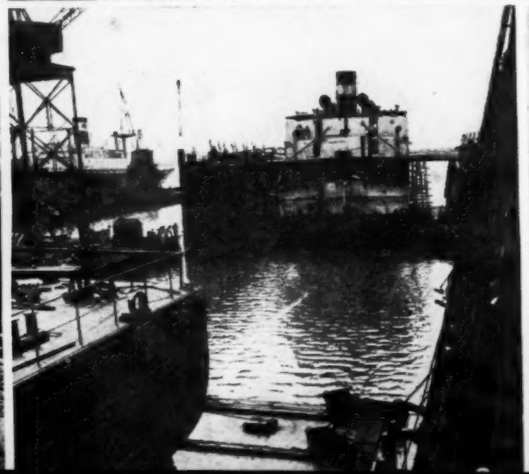
6. New midsection is ready for lining up and welding to old bow.

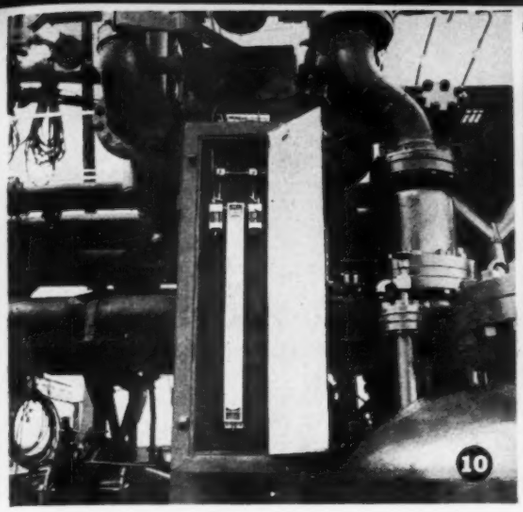


7. Midsection is ready for drydocking and welding.

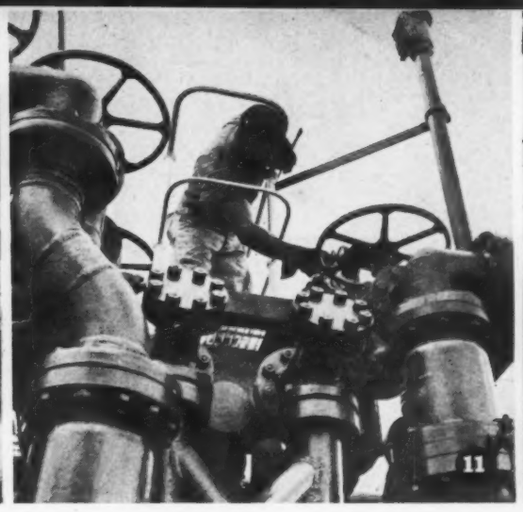
8. Old stern is towed in ready for final step in re-assembling the ship.

9. Completely refitted and rechristened the Esso el Salvador is ready for sea.

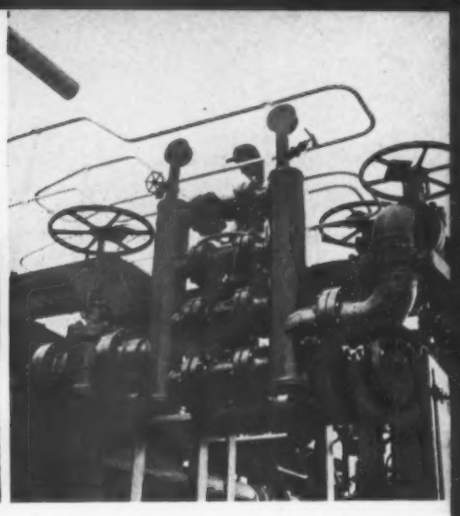




10. A Uehling gauge as well as a slip-tube gage is installed on each propane tank.



11. Duel pressure relief valves are provided in the vent line as an added safety measure. Vent at the right is flanged off except when gasoline is being carried in the pressure tanks. Remotely controlled hydraulic valves in vapor and liquid lines are shown at right and left.



12. Four excess flow valves are manifolded into the liqu line to prevent loss of product in case of ship-to-sh line rupture.
Photographs by Libsohn and Bubley for Standard Oil C (N. J.)

PERMITS LPG EXPORT TRADE

THE liquefied petroleum gas industry which has increased its sales in the United States 900 percent during the past ten years has begun to expand into other countries. The Standard Oil Co. (N. J.) and affiliated companies have installed pressure tanks in two of their tankers, the "Esso Sao Paulo" and "Esso El Salvador," and are said to be planning a third similar installation and also conversion of a larger ocean-going tanked to a carrier of propane.

The "Esso Sao Paulo" which received its initial load of LPG in July is the first tanker to carry bulk propane. Before the war the Shell intrests equipped a tanker to carry butane. That vessel was somewhat similar to the new ships now going into service in that pressure tanks were installed in ordinary liquid cargo compartments. The butane tanks had a lower pressure rating than is necessary for propane, however. Aside from Shell butane, the only ocean transportation of LPG has been in small steel bottles. This has made the cost of fuel so high that it was out of reach of all except a few wealthy consumers. This situation did not apply in Mexico or Canada where bulk quantities have been shipped by tank cars as regularly done in the United States, and in both of these countries a considerable volume of business has been developed.

Now that Jersey Standard has begun to develop its fleet of propane tankers, it is anticipated that distribution of LPG will expand rapidly in a number of Western Hemisphere nations which do not enjoy rail connections with the United States. At the outset Jersey's distribution will be through eighteen LPG bulk plants being built or already completed in three Central American nations, the Canal Zone, four South American nations and islands ni the Caribbean. The plants in several countries are owned by locally organized and partly locally owned companies.

Propane for Latin American distribution is to be manufactured in Latin America so that hauls will be kept at a minimum. Recovery equipment is being installed at Aruba, N.W.I., and at Talara, Peru. Production already has begun at Tropical Oil Co.'s gasoline plant at El Centro, Colombia. Tankers carrying the LPG to the various bulk plants from Aruba and Talara also will carry other bulk liquid products such as gasoline and kerosene. Space surrounding the pressure tanks in the ships' compartments will be occupied by oil products which may be transported in non-pressure tanks. This will add to the economy of LPG distribution.

The "Esso Sao Paulo" is a 16,035-ton deadweight capacity T2-SE-AI type tanker built in 1944 by Sun Shipbuilding & Dry Dock Co. for the U. S. Maritime Commission. Originally it was christened the "Whitehorse" but was renamed the "Esso Cambridge" and transferred to the Panamanian flag when bought by Panama Transport Company. Now that she has been converted to LPG service, her name again has been changed to "Esso Sao Paulo." The new name was selected in honor of the Brazilian city of Sao Paulo because she will be largely in service between Aruba and Brazilian markets.

The "Esso Sao Paulo" had a cargo oil tank volumetric capacity of 141,158 barrels before the propane tanks were installed. This has been reduced to about 138,161 barrels of normal products due to installation of the four 30,940-gallon (water capacity) propane tanks. Each of these cylindrical vessels is 13 feet six inches in diameter by 30 feet nine inches. The tanks were installed vertically in two forward oil-cargo compartments with all connections above deck.

The "Esso El Salvador" ex "Avila" is a much older and smaller vessel. She was built originally in 1938 as a 17,244 barrel tanker for short hauls and small cargoes in Latin American and Caribben service. She has been sailing under the Venezuelan flag but now is owned by Esso Standard Oil (Central America) S. A. and is of Panamanian registry. Present cargo oil tank volumetric capacity of the ship for normal liquid products is 14,400 barrels. The LPG tank volumetric capacity is 4,097 barrels (water capacity) making the new total capacity of the ship a little greater than before reconstruction. The increase in total volumetric capacity was due to a lengthening of the cargo oil tank body by 14 feet. The smaller ship will operate principally between the International Petroleum Co. refinery at Talara, Peru, and consuming centers on the west coast of South and Central America.

Conversion of the "Esso El Salvador" to LPG service was a job which Sun Shipbuilding & Dry Dock Co. undertook with a good deal of interest because of the problems involved. In its barest outline the task consisted of cutting off

bow and stern sections, scraping the center and installing an entire new center section. The job was unusually tricky because the new center section was built on a Sun way and launched before the Avila came to port for rebuilding. The Standard Oil Co. (N. J.) marine department, which supervised building the new section, was gratified the three sections matched perfectly when put together.

The method of building the center section in advance paid off in the time saved in getting the ship back to sea—no small item in these days of short shipping capacity. The "Esso El Salvador" was in drydock only 11 days, of which only eight days were required to install the new 132-foot length cargo tank body.

When the "Esso El Salvador" arrived at the Sun Shipbuilding plant at Chester, Pa., she was put in a drydock consisting of five 80-foot sections and lifted from the water. The bow was chocked and shored in one section of the drydock and the stern in another. The old midsection on two of the pontoons was cut away with propane torches and the stern in its own section of the drydock towed away. The previously-launched new cargo tank body then was towed in, drydocked, brought into position with turnbuckles and welded to the bow. Final act of the job was to tow in the old stern and weld it in place. Accompanying photographs illustrate the principal steps in the procedure.

There are four centerline-subdivided main tanks of 33-foot length in the new cargo tank body and two propane tanks, 11 feet 10 inch diameter by 27 feet 5 inches, have been installed horizontally in each, one on each side of the center bulkhead, and space around the propane tanks is used for usual products. Different products may be loaded on opposite sides of the center bulkhead in each tank if the flash point is the same. The propane tanks are built to propane working pressure, Marine specifications, of 300 psig and were given a 600-pound hydrostatic test before installation. These tanks were built by Sun Ship. All welded seams were x-rayed and the tanks as one piece were each stress relieved in a huge furnace, this being Sun Ship's standard procedure for building pressure vessels for oil refineries and other land purposes. All openings and connections for each tank are installed above deck in the four-foot-diameter dome which extends vertically up to and through the vessel's upper deck. Necessary movement of the pressure tank dome at its passage through the deck without loss of vapor or liquid from the main cargo tanks is made possible by use of a flex-packed annular stuffing-box secured to the deck and through which the dome extends above deck. The dome is electrically bonded to the hull to prevent static build-up during loading or unloading.

13. Propane tank similar to those installed on Esso el Salvador and Esso Sao Paulo.

There are eight weld-neck flanged-connection openings through the elliptical head of the dome of each propane tank. One opening is for the manhole, and one each for a slip-tube gauge, a Uehling gauge, a sampling line, a thermometer well and for duplex safety valves. Two remaining openings are for the four-inch vapor line and the six-inch liquid line.

Every precaution has been taken to insure safety of the operation. Safety valves for relief of pressure in the tank are duplicated. The safety valve line is vented to a flame arrestor termination at the top of the mast. Excess flow valves are installed in a manifold in the liquid and vapor lines. These valves are designed to close quickly and prevent loss of propane in case the line should break during either pumping in or out. A further safety factor to prevent loss of propane consists of hydraulic valves installed in the liquid and vapor lines at each tank. The hydraulic valves are held open by oil pressure and may be tripped to close from a point on deck near the tank dome, from the pump house or from points fore and aft at a considerable distance from the dome. Reed No. 300 two-way propane valves were installed on liquid and vapor lines because of their rugged and safe construction.

For delivering cargo from ship to shore, the pump room is equipped with two Dean reciprocating steam-driven pumps rated at 350 gpm each. Two five by five-inch steam-turbine-driven Worthington compressors are provided for maintaining pressure on the propane tanks during unloading or evacuating vapor from the tanks when all liquid has been discharged. Capacity of each compressor is 50 cfm. Normally one compressor is operated during unloading and the other is held as a standby. By using the compressor as a vapor pump after liquid has been evacuated from the propane tanks, pressure can be reduced below atmospheric so that the volume of propane remaining in the tank is reduced to a minimum.

In designing the LPG handling installation on the "Esso El Salvador," provision was made also for using the propane tanks for gasoline if that may become desirable. The vapor line has a vent which is installed when gasoline is to be hauled. Before propane is loaded again, the vent line must be removed and a blank flange installed. A section of piping must be removed from the gasoline loading and unloading line to the pressure tank and blank flanges installed before propane can be loaded.

A New Jersey Standard affiliate is reported to be planning an LPG carrier, having a capacity of about 1,200,000 gallons, and the product temperature during the voyage may be maintained at about 15°F through refrigeration and other special handling features. No announcement has been made by the company about the service into which the vessel may be put—Latin American, European or coastwise. A difficulty about propane vessels of such large capacity is the expense of building enough bulk storage to permit unloading a complete cargo at one point, unless a complete cargo can be unloaded, a good many people think that costs will be too high. In the case of the present ships with a propane capacity of 100,000 to 138,000 gallons, the company expects to have enough storage at most of the bulk plants to take a full cargo.

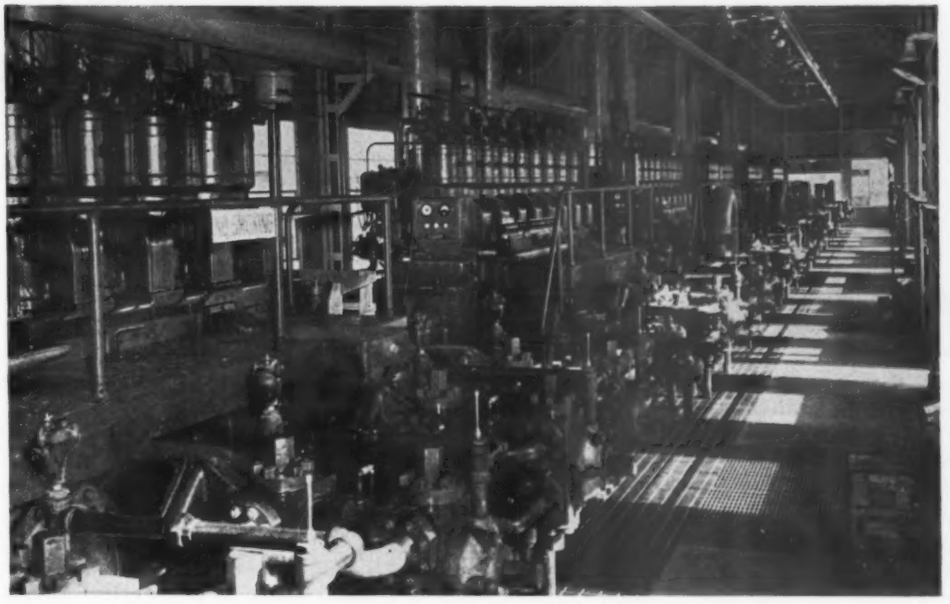
In Brazil, particularly, there already is a considerable business in LPG. The product has been imported in cylinders, largely from Argentina. The distributing company, Cia. National de Gas Esso, recently organized in Brazil by New Jersey Standard and Brazilian nationals, is putting on a sales campaign and expects to have 8,000 customers in Brazil by December of this year. Bulk plants are being built at Bella Horizonte, Santos, Sao Paulo and on Gobernador Island in the bay at Rio de Janeiro. The "Esso Sao Paulo" is expected to have enough business to justify a weekly run from Aruba to Brazil.

Brazil is a particularly fine country in which to market LPG. There are 20 cities in the country with a population of 100,000 or more, and only five of these have gas service at persent. Electricity is available, but plants do not have enough capacity to supply the full load. During the war years it has not been possible to buy new generating equipment to keep pace with the growing urban population. Brazil is deficient in natural gas, coal and similar fuels.

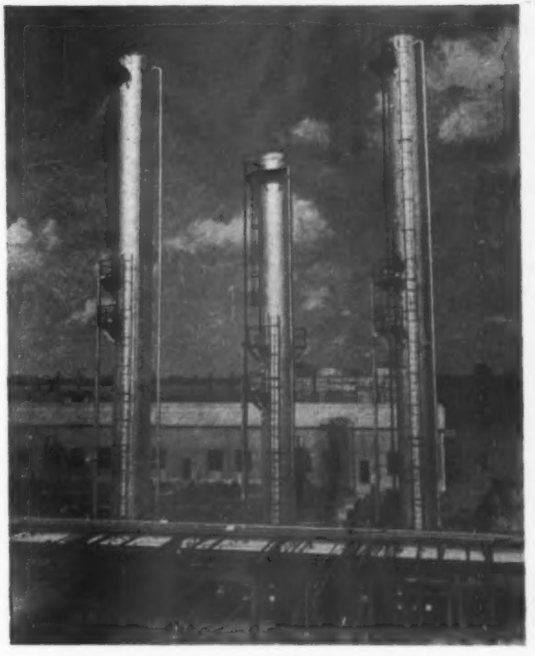
In Central America bulk plants are being installed at Caldera, Costa Rica; San Jose and Guatemala City, Guatemala; La Libertad, El Salvador; and Balboa, Canal Zone. Caribbean bulk plans will be located at Ciudad Trujillo, Dominican Republic; Kingston, Jamaica; St. Georges Bermuda; and Port-au-Prince, Haiti. LPG will be available to residents of Lima, Peru, from a bulk plant to be installed at Callao. A Peruvian distributing company has been organized with local capital participating. From the El Centro gasoline plant in Colombia propane is to be shipped to Marranquilla by barges operating on the Magdalena river. To Bogota the LPG will travel by barge, railroad and tank truck. In Colombia distribution will be through a domestic company known as Cia. Colombiana de Gas.

NEW CYCLING PLANT TO SAVE 30,000,000 BARRELS

OPENING of the cycling and pressure maintenance installation at Lake St. John, Louisiana, in July provided a noteworthy addition to the number of these developments in the Louisiana-Akransas-Mississippi area which are estimated to add over 100 million barrels to the ultimate recovery of the nine fields in which they they are located. Speaking to a group of state and oil company officials at the dedication exercises, Louisiana's Conservation Commissioner Joseph L. McHugh declared that the Lake St. John enterprise alone increases the state's recoverable reserve by 30 million barrels. He declared also, in referring to the state's efforts toward conservation in cooperation with the petroleum companies, that the flaring of gas had decreased during the past six years from 550 million cubic feet daily to about half that amount, while oil production had risen from 265 thousand barrels to 460 thousand barrels daily.



Six of the nine 800-hp Clark compressor units at the new Lake John cycling plant operated by The California Company.



Fractionating columns at the Lake St. John Cycling plant. Condensate fractionator is at the left, de-ethanizer is in the center and depropanizer at the right.

Development of the Lake St. John oilfield began in February, 1944, and from that time up to April 1, 1947, it had produced over seven million barrels of oil, 73,000 barrels of condensate and 12,582 million cubic feet of natural gas from 83 wells. Engineering studies made in 1945 indicated that there was little possibility of a water drive sufficient to maintain pressure and that its drop through natural depletion would result in serious waste through condensation. The principal operators in the field, the California Company and Carter Oil Company, controlling together 96 percent of the field, decided that gas injection was the most feasible means of preventing this waste and received the cooperation of a majority of the remaining four percent.

Construction of a recycling plant with a capacity of 100 million cubic feet of gas daily, designed to operate at a pressure of 1600 pounds per square inch and to inject gas to the reservoir at 4,000 pounds per square inch, was begun in 1946. The original pressure was determined to be 4,265 pounds per square inch at the 9,000-foot mark, and the original temperature was 253°F. The absorption and recycling plant will maintain a pressure of 4,000 feet per square inch in the reservoir during the life of the recyling operation, which is calculated at ten years with a production of wet gas at the rate of 100 million feet daily.

This will require the return of all residue gas from the plant and approximately 50 billion cubic feet of make-up gas from other gas sands. Fuel requirements will dispose of 54 billion cubic feet of gas. Dry gas reserves will be produced at the end of the recycling operation.

Dry gas will be injected at the center of the field at the rate of 128.3 million cubic feet daily, and production will be taken from wells ahead of the expanding gas front. During the early part of the recycling period the production of oil will be held to 14,000 barrels daily, declining thereafter to depletion as the gas cap expands and encroaches on the oil zone. At the end of the pressure maintenance and recycling period the pressure will be released and a part of the injected gas and solution gas dissolved in the oil and any wet cap gas previously by-passed will be produced. This phase of the operation is computed to have a life of 15 years at an average rate of 65 million cubic feet per day.

Through the operation of this plan the production of butanes and heavier fractions originally in place in the gas zones has been calculated at 89.4 percent as compared with 63.6 percent recoverable otherwise. Recovery of oil in place has been estimated at 45 percent as compared with 40.6 percent under competitive conditions.

The complete installation at Lake St. John represents an expenditure of $4,500,000, of which $3,000,000 was spent on the manufacturing plant and $1,500,000 on pressure maintenance.

AUTOMATIC CONTROL ON THE PORTLAND - MONTREAL PIPELINE

By C. D. Batchelder[1] and R. A. Rockwell[2]

THE Portland-Montreal pipeline was constructed during 1941 as a defense measure to provide year-round deliveries of crude oil to the four refineries at Montreal. Previously these refineries received deliveries direct by tanker during seven months only, as the St. Lawrence River is ice-bound during the five winter months. The pipeline eliminates a round trip by tanker of approximately 2,000 miles which was particularly important during the war when there was a shortage of ships and the German submarines were active along the eastern seaboard. The main line is welded, 12 inches in diameter, built out of seamless pipe with a wall thickness of ⅜ inch. The total length of the line is 236 miles with 166 miles located in the United States, crossing Maine, New Hampshire and Vermont, and the balance of 70 miles running through the Province of Quebec from the international border at North Troy, Vermont, to Montreal.

The Portland-Montreal pipeline was financed and constructed by the Standard Oil Company (New Jersey) through subsidiary companies. The Portland Pipe Line Company, a Maine corporation, owned and operated the United States end of the line, and the Montreal Pipe Line Company, Limited, a Canadian corporation, owned and operated the Canadian end of the line. Deliveries are made to the refineries at Montreal of the British American Oil Company, Ltd., McColl-Frontenac Oil Company, Ltd., Imperial Oil, Ltd., and the Shell Oil Company of Canada, Ltd. In April, 1946, the Standard Oil Company (N. J.) sold its entire interest in the system to these four Canadian companies, and at that time the four companies formed a new Maine corporation, the Portland Pipe Line Corporation, and took over the assets and operation from the Portland Pipe Line Company.

Crude oil is delivered by tanker at the new steel and concrete unloading pier at South Portland, Maine. This pier accommodates two tankers at one time and unloads up to 15,000 barrels of crude per hour. Loads are discharged either through a 24-inch line approximately three miles long to the tank farm where the first main line pump station is located, or through a 16-inch line to two storage tanks located on shore. Oil unloaded into the shore tanks is later transferred by centrifugal pumps to the tank farm through the 24-inch line. Combined storage capacity of the waterfront terminal and the tank farm is a little over 1,100,000 barrels.

There are seven booster stations along the line, besides the initial station, spaced about thirty miles apart. These stations handle up to 70,000 barrels of crude per day, discharging at a maximum pressure of 800 psi into the main line. Portland receives oil from a number of fields in South America and the mid-continental United States, and the crude batched through the Portland-Montreal line has a wide range of characteristics. During the war the line carried several emergency batches of aviation gasoline but now handles only crude oils. Gravities range from 19° to 47° API, and viscosities from 34 to 1500 SSU (Cumarebo to heavy Colombian). In some instances crudes with a very high wax content are blended to lower the pour point, and in other cases high viscosity crudes are cut back with casinghead gasoline to improve their pumping characteristics. Crudes of this nature present a problem more or less peculiar to this particular line. Atmospheric temperatures in some locations drop to 50° below zero in winter, and oil temperatures in the line drop to 33° above. During the winter months a maximum allowable pour point of 20° is maintained to avoid the possibility of the oil in the line going solid if there should be a forced shutdown with a resulting temperature drop in the line. Should such a catastrophe occur it is probable that the system would be shut down until the following spring. All outside work on the line is done during the summer, as the ground is frozen solid in winter and can be broken only with a pneumatic drill or a concrete buster.

Of the eight mainline pumping stations, six are electric and two are diesel (where electric power supply facilities are inadequate). The motors are the product of Electric Machinery Mfg. Co. in the United States and General Electric in Canada. They are synchronous, unit power factor motors rated at 500 hp. 327 rpm, 2300 volts. Of the diesels at the other two stations, two are 16¼ inch by 23 inch, four cycle, six cylinder heavy-duty straight Busch-Sulzer engines delivering 600

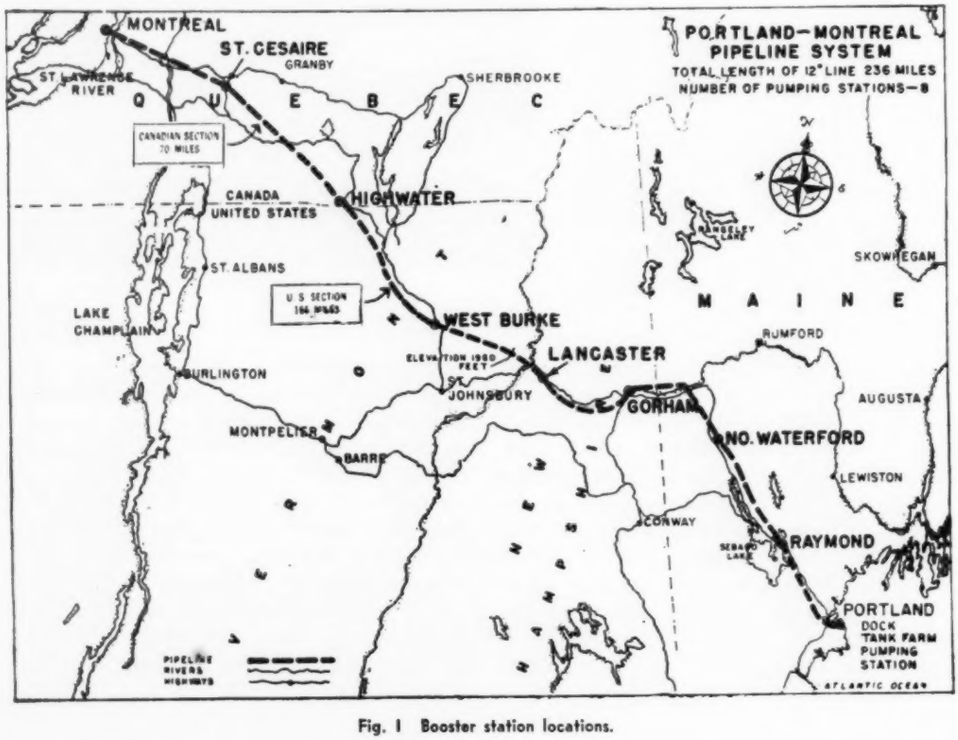


Fig. 1 Booster station locations.

(1) Chief engineer, Portland Pipe Line Corp.
(2) Director of Engineering, Mason-Neilan Regulator Co.

hp at 225 rpm, and two are McIntosh-Seymour engines of 500 hp at 225 rpm. Pumps are positive displacement, triplex double-acting plunger type. Fourteen are Goulds 6¾ x 27 inch, two are Prescott 7⅛ x 24 inch. Fireproof walls with stuffing boxes for the shafts separate the pump rooms from the prime movers.

Originally this line operated as an "open" system. A 30,000 barrel over-and-short tank at each booster station floated on the line. An eight-inch back pressure regulator maintained the suction pressure to the pumps at or below 20 psi. If the pumps could not handle the full throughput of a preceding station, the suction pressure would rise, partially opening the regulating valve and shunting the excess oil flow to the tank. The tank would then take on oil until the regulating valve closed up again, after which the contents of the tank would remain constant or would flow back through a check valve to the pump suction, if the suction pressure fell below the static tank head. The valve was large enough to route the full stream to the tank in case of station shutdown.

Operators formerly controlled station pumping rates by hand-operated plug valves on by-passes between the pump discharge and suction headers. This manual control system required constant attention by the station operators to maintain an even pumping rate, and it was the study of this problem that led eventually to the adoption of the new control system.

First the elevation profile of the territory through which the pipeline operates is such that between certain pump stations there are critical points, especially at the slower pumping rates. It can be seen that this condition would cause line surges, and to alleviate this the station operators would adjust the pump by-pass flow in order to reduce pump pounding and smooth out the pumping rate.

Second the manual control system augmented the work of operators and dispatchers. The operator frequently had to adjust the hand-lever-operated plug valves on the pump by-passes up to a dozen times per shift as his dispatcher directed him. Every time an operator changed his by-pass setting, it would throw off all other stations, forcing them to readjust their pressures and so on up and down the line. This gave the flow a long-term cycling effect. The operator had to observe his pressure record carefully and relay the data to the dispatcher who would try to correlate the records of all stations and direct the operators accordingly. With the tanks in use the operators had to go outdoors and gauge the tanks hourly even in the roughest weather.

The third problem, and probably the most serious of all, was contamination. With as many as three different tenders of varying grades in the 236-mile line at one time, the over-and-short tanks would be intermittently mixing one grade of crude with another. There was no positive way with the station tanks on the line to eliminate contamination, although by careful operation it was kept to a minimum. This condition was particularly serious with lube stock being batched through, as any contamination seriously affected the refinery operation. The remedy for this was to operate as a closed system and do away with the over-and-short tanks.

These, then, were the reasons for the changeover to automatic control: to stop contamination of the various grades of crude oils, to maintain a controlled suction pressure to the pumps, to limit the maximum discharge pressure and to simplify the operators' and dispatchers' work.

The system chosen for automatically controlling the Portland-Montreal pipeline is based on series operation of the suction and discharge controllers. This basic method has been used by a number of pipelines, both for refined products and crude,

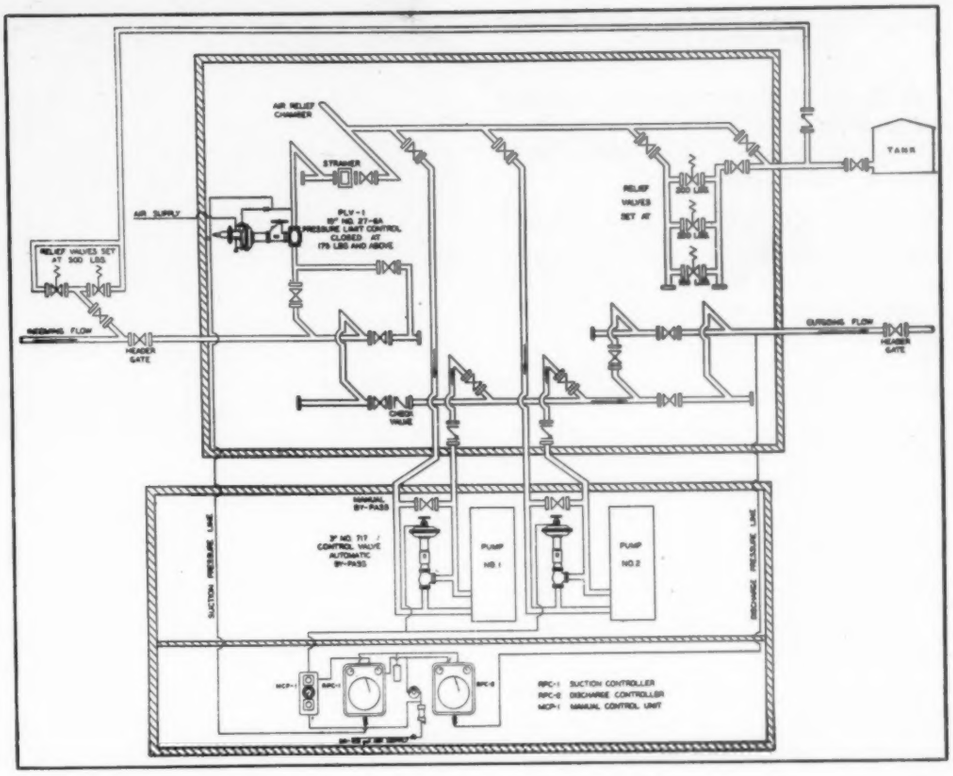
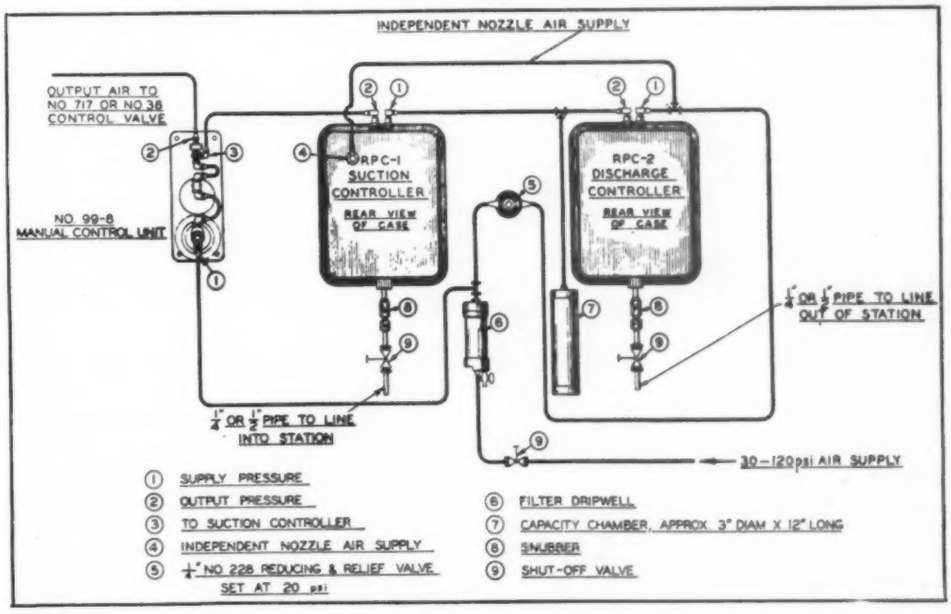


Fig. 2 Control system at four booster stations.

Fig. 3 Showing series operation of controllers.


INDEPENDENT NOZZLE AIR SUPPLY
OUTPUT AIR TO NO 717 OR NO 38 CONTROL VALVE
NO 99-B MANUAL CONTROL UNIT
RPC-1 SUCTION CONTROLLER
REAR VIEW OF CASE
RPC-2 DISCHARGE CONTROLLER
REAR VIEW OF CASE
¼" OR ½" PIPE TO LINE OUT OF STATION
¼" OR ½" PIPE TO LINE INTO STATION
30-120psi AIR SUPPLY
① SUPPLY PRESSURE
② OUTPUT PRESSURE
③ TO SUCTION CONTROLLER
④ INDEPENDENT NOZZLE AIR SUPPLY
⑤ ¼" NO 228 REDUCING & RELIEF VALVE SET AT 20 psi
⑥ FILTER DRIPWELL
⑦ CAPACITY CHAMBER, APPROX 3" DIAM X 12" LONG
⑧ SNUBBER
⑨ SHUT-OFF VALVE

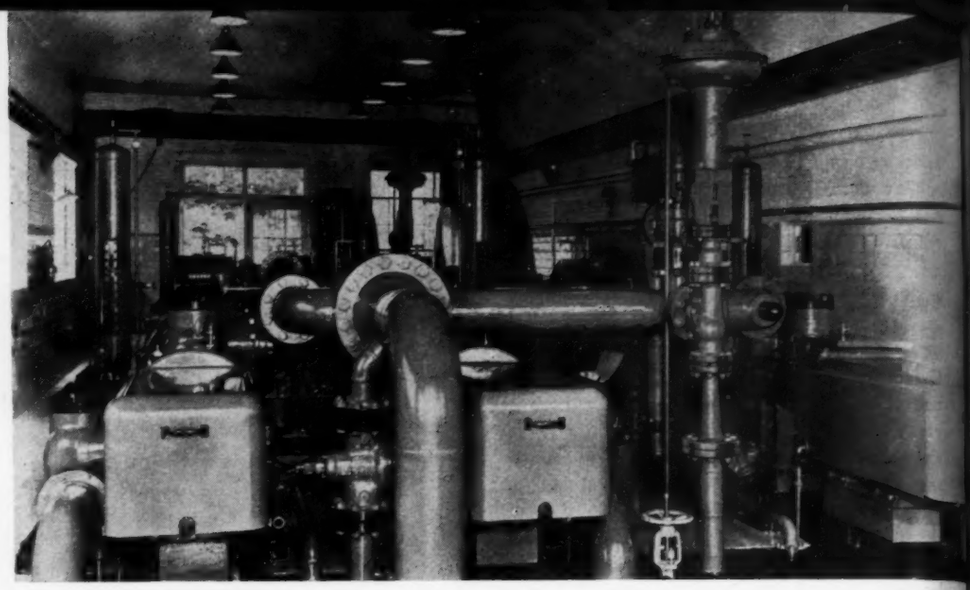


Fig. 4 Control valve in cross-over line between suction and discharge headers.

with the details of the equipment, installation and operation modified to meet local conditions. This control system and its individual elements appear in Figures 2 and 3.

(1) Control Valves: The three-inch angle-type air-to-close control valves are installed in cross-over lines between the suction and discharge headers. There are two valves at each station, one for each pump. These provide for suction and discharge pressure control on either or both pumps.

The valve has a diaphragm motor pressure range of three to 15 psi. That is, the valve is open until the controller output air pressure increases to three psi, when it will start to close. Further pressure increase progressively closes the valve until at 15 psi it is shut. Increased air pressure to the valve tends to close the valve, reducing the by-pass flow around the pumps, increasing the flow through the station.

(2) Low Limit Suction Pressure Control: The measuring element of the suction controller measures the suction of the station. The predetermined control point is set at about 25 psi or more depending on the conditions at the individual station. The output air pressure of the discharge controller is the air pressure supply to the suction controller.

Assuming that the discharge pressure is below the control point of the discharge controller (about 800 psi), the output pressure of this controller is always the same as its air supply pressure—in effect, the discharge controller is by-passed. When the suction pressure is over 25 psi, the output air pressure of both suction and discharge controllers is 15 psi; therefore, the control valve is shut.

If the suction pressure begins to drop below 20 psi, the suction controller immediately reduces the air pressure to the three-inch angle valve. This opens the valve when the air pressure is below 15 psi, thus by-passing back to suction some of the outbound oil flow.

The range of the recording and controlling pressure instrument is 0 to 250 psi, with protection for 100 percent overload or to a total of 500 psi.

(3) High Limit Discharge Pressure Control: The measuring element of the discharge controller measures the discharge pressure. The predetermined control point is set at about 800 psi. Assuming that the output air pressure from the suction pressure controller is 15 psi, the output air pressure from the discharge pressure controller is also 15 psi as long as the station discharge pressure is below the control point of 800 psi. Therefore the valve is shut.

If the station discharge pressure begins to exceed 800 psi, the discharge controller immediately decreases its output air pressure to the control valve. This increases the by-pass flow to suction, limiting the station discharge pressure to 800 psi.

(4) Series Operation of the Suction and Discharge Controllers: Either the suction or discharge controller may govern the actual opening (exposed area) of the control valve, but never both at the same time. The maximum air pressure to the control valve diaphragm is 15 psi. Either controller can reduce this pressure, and the controller that establishes the lower output air pressure governs the valve opening.

(5) Independent Nozzle Air Supply Pressure on Suction Controller: When the discharge controller comes into operation, the control mechanism of the suction controller is completely by-passed. At this time the output pressure from the discharge controller is the only supply pressure available for the pilot and nozzle. If the output from the discharge controller is below 10 psi, the nozzle and pilot operation is sluggish; below seven psi, they are inoperative. Therefore, an independent nozzle air supply of 20 psi is brought to the suction controller.

The major functions of the control system are to:
(1) Set and maintain within limits the throughput of the initial station at Portland.
(2) Adjust the individual booster station pumping capacity to the throughput of the initial station at Portland.
(3) Limit the minimum booster sttaion suction pressure (inbound).
(4) Limit the maximum booster station suction pressure (inbound).
(5) Limit the maximum station discharge pressure (outbound).

The originating station at Portland sets the discharge control to maintain an optimum constant discharge pressure. This determines the pipeline throughput. Under constant operating conditions a fixed discharge pressure will hold the flow constant. Variation in flow results when tenders with different viscosities are introduced. The change in flow from one tender to a second tender is gradual as the first tender becomes displaced in the line. The discharge controller gives the operator a simple means of setting the precise discharge pressure and the line throughput.

Unless operating conditions are such that there is a bottleneck at some booster station, all stations normally operate on suction control. When the suction pressure is held constant the booster station pumps out all that comes into it. If the flow entering a station increases the suction pressure tends to increase and the controller further throttles the valve (Fig. 4) in the by-pass around the pump. This increases the station pumping capacity to match exactly again the quantity entering the station. Thus any change in throughput made at Portland causes all booster stations to adjust their pumping capacity to match. This is the only way a closed system can operate.

Holding the suction pressure to a minimum permits the line to operate at the lowest static pressure permissible with the line throughput. The suction pressure must be held to a positive value for the pump to fill properly on the suction stroke; otherwise pounding results. The suction pressure at various stations is frequently set at different values, depending on the hydraulic gradient of the line entering the station.

In order to protect the pump suction manifold against high static pressure, a 10-inch pilot-operated back pressure regulator (Fig. 5) functions on the suction line to the pump. This regulator is set at 175 psi and as long as the pressure is below 175 psi, the valve is wide open. If the suction pressure tends to exceed 175 psi, the regulator closes as required to prevent further pressure increase. When the incoming line pressure exceeds 185 psi, the relief valve opens, relieving to tankage.

The discharge controller setting establishes the maximum discharge pressure. When the pressure tends to increase beyond this setting, the discharge controller opens the pump by-pass valve as required to limit the pressure.

In selecting the type of controller to be used, the major considerations were ruggedness and

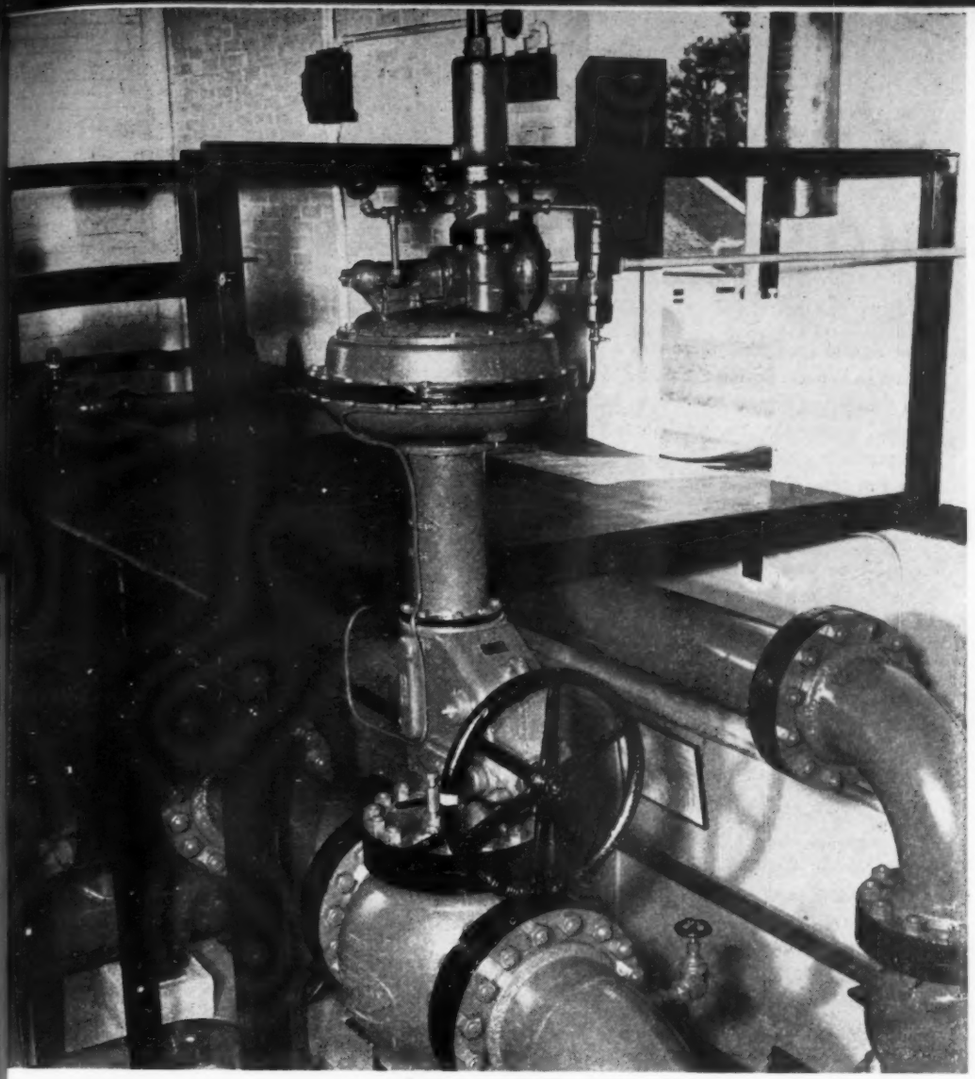


Fig. 5 Pilot-operated back pressure regulator protects pump suction manifold.

simplicity. Both the suction controller and the discharge controller are "proportional controllers" without reset. The use of reset would permit a constant control point under load change where the proportional controller allows the control point setting to vary, and the setting index does not always indicate the exact control point. Reset was avoided as its disadvantages outweighed its advantages. First, it adds complication in requiring two stabilizing adjustments instead of one. As far as line operation is concerned it is important that the controller level out the pressure and flow following any change as quickly and smoothly as the pipeline system will permit. Rocking the line and nursing pressure waves should be avoided. It is true that with proper adjustment of the reset rate (very slow rates), stability can be achieved with reset. However, with stations spotted from Portland across the border into Montreal, it seemed impractical to introduce the intricacies of reset into isolated stations where skilled instrument service would be very hard to get.

The major reason for not using reset, however, is that the suction and discharge controllers are interlocking controllers operating the same control valve (Fig. 2). In operation either the suction or the discharge controller positions the bypass control valve. The controller that is not operating the valve is by-passed with either full supply pressure or the diaphragm pressure equalized in the reset control system. If operating conditions then require the controllers to swing from suction to discharge control or vice versa, the position of the proportional band may be at any location with respect to the setting index, and appreciable deviation in pressure may result until the reset has had time to balance out the control point. The proportional controller has the advantage that the proportional band remains fixed with respect to the setting index. Its operation is never discontinuous, which is not true of a reset controller balanced at a 20 psi supply pressure when the control valve is fully closed at 15 psi.

The only way to vary the capacity of large constant speed positive displacement pumps is to bypass the flow from the discharge header to the suction header. This is a rather tough control valve application. The required valve capacity is large and the pressure drop across the valve is appreciable. The normal discharge pressure is 600 to 800 psi. The normal suction pressure is 25 psi. The pressure drop across the valve is thus 575 to 775 psi. The control valve employed (Fig. 4) is a three-inch angle-type valve with heat-treated stainless steel rim, hardened to a Brinell of 500 or a Rockwell C of 50. The handwheel shown on the diaphragm motor is for setting the opening of the valve manually. The three-inch valve has a reduced area port and will give a maximum of 25,000 barrels per day at 600 psi pressure drop in the full open position.

Cavitation is one of the serious problems met with when control valves operate on liquid service under high pressure drop. Excessive erosion in valve body trim and adjacent piping mark the cavitation condition, and in this case there was also a rumble and vibration with unbearable noise. Extensive experimental work was done in the hydraulic laboratory and at the booster stations to determine the valve plug contours and the piping arrangement to produce a quiet and satisfactory valve for this service.

After this treatment of the control system and control equipment it is in order to look at the results of operating the pipeline by automatic control. Six months of operation show results which are most satisfactory. Instrument charts made under automatic control show far less fluctuation in suction and discharge pressures with those taken from manual control of the closed system. The dispatcher's work is now much easier. His problem now is to direct the output of South Portland, the initial pumping station, so that the station of least capacity can handle the throughput while there is minimum energy loss through throtting valves in the system. To cut back on the throughput, the initial station merely resets the control point of the discharge pressure controller to a lower value and does the same during transition from a high viscosity to a lower viscosity tender.

With this system the over-and-short tanks will serve during scraper operation. About every two to three weeks the scraper is started through the line, and the tank at the next staiton goes on the line just before its calculated arrival. The tanks at the first two booster stations are connected to relief valves on the incoming line, so that in case the suction pressure exceeds 185 psi, the crude oil flows to the tanks. Should either of these stations have a shutdown, the incoming stream is by-passed to the next station, with a decrease in throughput of approximately 33 percent.

One expects that the pipeline management and engineers would approve a control system such as this because they can see the overall advantages in it and see that uniformity of operation pays off. But the engineers do not have to operate the booster stations, do not experience the strained watchfulness, physical exertion or exasperating repetition of movement necessary to manage a station under manual control or under a poorly integrated automatic control system. Nor do they have to cope with the maintenance and adjustment of a highly complex control system. The station operator is the man who lives with the control system, and his independent opinion of its operating merits has importance.

BRITAIN WILL SLASH OIL IMPORTS TO SAVE DOLLARS

ABOLITION of the Basic gasoline ration will bring no relief to British motorists. On the contrary it means the virtual suspension of all but the most vital commercial and industrial use of petroleum products in pursuance of the policy of austerity to which the government is committed. Discussing the situation before Parliament on August 6 the Prime Minister referred to the earlier statement of the Chancellor of the Exchequer that a reduction of 500,000 tons in oil imports would result in a saving of four million pounds and said, "We intend to effect at least this saving." Those words "at least" suggest that the reduction of one-third in allotments to private motorists and of 10 percent for commercial vehicles together with drastic cuts for the armed services, all of which were scheduled for October 1, may not mark the limit of the government's attempted economics in the use of petroleum products.

Since the primary purpose of the enforced reductions that are being made in many kinds of imports is to minimize the output of dollars the effort will be made to draw the major part of importations during the coming year from territories where payment can be made in sterling and as little as possible from dollar areas. Despite efforts to increase the Empire's own contribution to supplies this remains necessadily small but imports from other sterling areas are capable of providing the major part of the greatly reduced quantity which it is proposed to admit.

In 1938, the last full year per-war, the United Kingdom obtained only 7.9 percent in bulk of its petroleum supplies from British sources. During 1945 only 3.1 percent was so obtained, but in 1946 the total from British sources had risen to 8.7 percent, a larger proportion than in pre-war years. Imports from the United States were 18 percent in 1938, 75.8 percent in 1945 and 27.9 percent in 1946.

Receipts for the period 1939-1945 were influenced primarily by war conditions and are not comparable to peace time circumstances. Briefly, however, these figures show a gradual increase in imports from 1939 to 1941, a sharp fall in 1942 to below the imports of 1939, followed by a large increase in 1943-1944 to double the imports of 1942, these increases being mainly in imports from the United States.

Table I gives the net consumption of liquid petroleum products in Great Britain for the years 1938, 1945, 1946 and the half year ending June 30, 1947, in millions of imperial gallons.

These figures show that there was a gradual reduction in imports during the past 2½ years; and from the import figures of the first half of 1947, it would appear that the total imports of petroleum products into Great Britain in 1947 will be much less than those of the immediate pre-war year.

A notable post-war increase in the import of gas oil can be accounted for by the growing use of compression ignition engines for transport work of various kinds, and in the use of diesel engines as stand-by plant for electricity generation. Indicative of the economic crisis in the country is the very large decrease in the imports of fuel oil during the past six months.

This can probably be accounted for by the fact that the changeover from coal burning to oil fuel burning in boilers and furnaces has been held up by shortages of steel for tankage construction; so stocks of fuel oil accumulated in 1946, are awaiting consumption and are occupying the main storage at ocean and other depots. As this storage is gradually cleared, imports of this product should increase although the situation is complicated by the financial crisis due to the rapid depletion of the American loan. Unless further arrangements can be made, it will be necessary for Britain to rely on its slender sterling resources for practically all its imports of petroleum.

Increase in kerosene consumption is attributed to two causes: increased mechanization of the farming industry, and greater domestic consumption for heating due to shortage of coal.

In 1938 when sterling was freely available over the world, about 67 percent of the petroleum consumption of Great Britain was purchased from sterling sources and 33 percent from the rest of the world.

The following table shows the gross bulk imports in 1945-46 from sterling and other sources, but does not give the net figures after accounting for re-exports and bunkers.

Sterling Purchases in units of 1000 Imp. gal. and per cent of total

	1945		1946	
	Volume	% of Total	Volume	% of Total
N.W.I.	792,709	18.5	1,239,645	32.6
Iran	56,187	1.3	810,665	21.3
B.W.I.	90,937	2.1	250,908	6.6
Other British	46,939	1.1	78,659	2.1
	986,772	23.0	2,379,877	62.6
Purchases from other sources				
U.S.A.	3,255,237	75.8	1,065,439	27.9
Venezuela	36,594	0.9	139,985	3.7
Peru			15,049	0.4
Other Foreign	11,060	0.3	205,707	5.4
	3,302,891	77.0	1,426,180	37.4

It will thus be seen that the positions of 1945-1946 have been practically reversed with respect to the quantities imported; the figures of 1946 being quite close to those of 1938.

The monetary value of these imports, however, shows great differences and has an important bearing on the financial side. In 1938 the value of the total imports was £45,979,000 in 1945 £145,617,000 and in 1946 £86,851,000.

Taking the quantity of imports as 100 in 1938, those of 1945 were 134 and of 1946 119, whereas the value percentage in 1945 was 319 and in 1946 it was 189.

In 1938 the value of imports from the United States was £17,261,000; in 1945 £120,466,000, and in 1946 £34,892,000.

To bring these figures more up-to-date, a comparison of the value of petroleum imports for the half year to June 1947 with the corresponding half year of 1946 is of interest.

	Total Imports	Imports from U.S.A.
January to June 1946	£44,026,316	£15,079,566
" " 1947	£39,720,523	£14,338,541

This shows that reduction of imports from the United States has been less than from other

Table I

Net Consumption of Oil Products in Great Britain
(Figures in Millions of Imperial Gallons)

	1938		1945		1946		1947 Jan.-June	
	Volume	% of Total	Volume	% of Total	Volume	% of Total	Volume	% of Total
Crude Oil	568.0	20.8	227.7	5.9	537.3	16.6	297.7	24.4
Motor Spirit	1384.9	50.8	2087.9	54.5	1161.5	34.0	533.1	43.7
Kerosene	191.5	7.0	339.6	8.9	398.9	12.3	168.7	13.8
Lubricating Oil	86.5	3.2	71.5	1.9	50.7	1.6	48.4	4.0
Gas Oil	128.8	4.7	482.0	12.6	427.3	13.2	144.8	11.8
Fuel & Diesel Oil	352.6	12.9	580.2	15.1	638.3	19.7	19.5	1.6
Other Oils	15.5	0.6	40.6	1.1	19.3	0.6	8.9	0.7
Total:	2727.8		3829.5		3233.3		1221.1	

sources. A factor which has favorably affected imports from the United States has been the shortage of tankers and also the "short haul" policy of the British government.

The effect of the nationalisation of road transport cannot yet be estimated, but presuming it follows the trend of other government controlled services, it is very probable that costs will rise and that there will be an increase in fuel consumption due to less economy being exercised in the running of the vehicles. In addition, the new flat tax of £10 on passenger vehicles will no doubt lead to a general increase in the size of engines for private vehicles, causing a further rise in consumption.

The increased use of fuel oil, when steel for tankage is available, will be another factor affecting consumption, and one may assume that instead of an annual increase of five percent in consumption, it will be more on the order of 10-15 percent, which means that by 1950 the petroleum requirements of Great Britain will be about 15 million tons per annum.

This is a small percentage of the world's production which was 353.1 million tons in 1945 and 373.1 in 1946. With consumption in the United States overtaking its own production, Britain will have to look for supplies to other countries and attention is necessarily focused on the Near East.

In 1938 this part of the globe produced about 16 million tons of petroleum, while the preliminary figures for 1946 show that production there has increased to over 32 million tons, and it is probable that during the next five years this production be more than doubled.

As mentioned before, the Persian Gulf companies have to ship all their oil by tanker from that location, but projects in hand for the building of pipe lines in that area will increase the flow of crude to Mediterranean ports from about four million tons to over 40 million tons, and will thus reduce the haulage to Britain to less than that from the Gulf and Caribbean ports.

(Continued on page 72)

ITALY PLANS TO INCREASE OIL IMPORTS

As an aid toward meeting Italy's growing need for petroleum products, attention is being directed to the possibility of reciprocal arrangements with outside interests to supply part of its requirements while at the same time obviating the difficulties arising from the lack of foreign exchange. A number of such proposals are reportedly under negotiation aside from the combinations between private Italian and international oil companies which have been made known previously.*

One of these reports concerns a deal said to be under discussion between the Permolio oil refinery in Milan and the Ministry of Petroleum of Venezuela, which has in view the shipment of 70,000 tons of crude oil monthly from Venezuela to Italy where it would be refined in the Milan refinery of Permolio and in a new refinery to be erected at Genoa by a joint Italo-Venezuelan oil concern, the capital of which would be a subscribed 51 percent by Permolio and 49 percent by the Venezuelan government. It is understood this company would undertake the distribution of products to the Italian market and possibly to other Mediterranean countries. According to these plans the Genoese refinery would be completed in 1950, and the necessary machinery and equipment would be supplied by Venezuela as an advance of the share of capital engaged in the new concern.

Another reputed trade exchange is based on Russian negotiations with Italian shipbuilding yards for merchant tonnage to be paid for by the delivery of 200.000 tons of crude oil. A first shipment of 10,000 tons of Russian oil has arrived at Vado Ligure (Savona) as an advance on the crude to be supplied in payment for the tugs and other vessels under construction at La Spezia for Russian account.

Furthermore, it is stated that the Breda Locomotive Works at Milan is negotiating with the Romanian State Railways an order of 20 diesel engine and rail cars to be paid for by shipments of Romanian crude oil.

In the Italian official quarters in Rome, it is pointed out that because of the lack of foreign exchange and gold currency, the government favors the import of oil on a barter basis. At the same time it is stated that the pressure on the fuel oil market has been slightly eased by recent larger imports of coal and by the decision of the Italian State Railways Administration to stop truck services where railway facilities have been rebuilt.

Meanwhile the search for indigenous deposits of oil and gas is going forward in different parts of the country. Exploratory work on the Italian peninsula is under way in four zones: (1) the Lombardy region, (2) the Ferrara district, (3) the Tuscan region and (4) the Sicilian territory.

Oil researchers in Lombardy are conducted by the Azienda Generale Italiana Petroli (AGIP) and are centered in the Lodi district near Caviago and in the Piacenza district near Podenzano and San Giorgio. While exploration in the two last mentioned villages has not disclosed any important oil deposits, five wells have been drilled in the Lodi district and a sixth is under way at Rifalda near Crema. Already at 1,500 meters with an opening of 5 mm., an output of 43,000 cubic meters has been obtained. Drilling will continue at this point as the rig employed is able to go to a depth of 3,000 meters. It is reported that AGIP has received offers from British oil concerns to cooperate in the oil search in the Lodi district.

Exploration in the Ferrara district is carried out for the Societa Petrolifera Italiana, a subsidiary of Standard Oil Company (N. J.). The whole zone from Padova to Bologna along the Adriatic through Rovigo and Ferrara has had important methane manifestations which support the possibility of oil production. The results of the geophysical surveys are not disclosed, but a statement has been made to the press by the managing director of SPI to the effect that failure to find oil heretofore in the Po Valley does not mean that the territory does not possess such resources. Meanwhile it is announced that Standard Oil Company (N. J.) has applied officially to the Italian government for a concession in the Ferrara district. There are also reports of plans to build a refinery at Ferrara to handle Middle East oil destined to the Italian and Central European markets.

In the course of an interview granted to the press, Engineer Boccalery and Signor Borrego of the Western Geophysical Company pointed out that while no oil discoveries, such as have been rumored, have been made, extensive gas deposits have been located, the existence of which indicate that at greater depths it may be possible to find oil. As a matter of fact, gas has been disclosed at the depth of 300/400 meters only, and during July, 1947, there has been an output of 9,000,000 cubic meters, which means a yearly output of 108 million cubic meters, which may be increased to 10,000,000 cubic meters daily. Signor Borrego believes that at the depth of 2,000/2,500 meters there should be important oil resources.

Oil search in the Tuscan region is being carried out by the Societa Idrocarburi Nazionali, a subsidiary of the La Centrale Electric Company which operated some wells at Pietramala at depths varying between 1,000 to 1,500 meters and has just brought in another well on the Appenines in the Forli district. In Sicily the McMillan Petroleum Company has put down several test wells at Trapani and Licata which are to be carried to a depth of 3,500 meters.

* See WORLD PETROLEUM, September, 1947

CENTRIFUGAL COMPRESSORS WIN WIDER USE IN OIL AND GAS INDUSTRIES

THE chief engineer of a major oil company recently was asked for an opinion as to why the petroleum industry has standardized largely on centrifugal liquid pumps for many years and yet has not adopted centrifugal gas pumps. The only essential difference between the two devices, it was pointed out, is that the liquid centrifugal handles relatively noncompressible fluids, whereas the centrifugal gas compressor handles compressible fluids and must be modified accordingly. The engineer thought a moment and then said: "I suppose we are really a conservative profession. We wait for the other fellow to try it out before spending our own company's money."

The answer probably was an oversimplification because engineers are quick to adopt new methods and new equipment when economic necessity requires pioneering. Without low-cost oxygen, the American variant of the Fischer-Tropsch synthesis will not be successful, so designing engineers are adopting centrifugal compressors for handling large volumes of air and hydrocarbons to reduce investment and maintenance. The Big Inch gas line will use centrifugals at many stations because, when operated as an oil line, pump stations were equipped with electric motors to which centrifugals can be directly connected and the line put in operation far more quickly than if reciprocating engines and compressors had to be ordered. Also the compressor manufacturers have been busy perfecting seals and lubrication.

In any case centrifugal gas compressors are being ordered by the petroleum and natural gas industries in greater and greater volume. One order given Clark Brothers, for example, was for 21 compressors totaling over 70,000 hp. to compress air, oxygen and hydrocarbons.

Tennessee Gas & Transmission Company recently was granted permission by the Federal Power Commission to spend $475,000 installing an experimental compressor station on its gas line to the east. The station will be equipped with three Ingersoll-Rand centrifugal compressors which will handle 350 million cubic feet of gas daily. Compressors will be directly connected to squirrel cage electric motors developing 5,500 hp. and operating at 3600 rpm.

The Tennessee experiment is somewhat remarkable because the company will have to buy power instead of using low-cost fuel from its own line as it does for gas-engine-driven reciprocating compressors. A good many compressor people have thought that adoption of centrifugals by gas lines would have to wait until the gas turbine is perfected to the point where it can be installed as a prime mover. The gas turbine would have the advantage of not requiring water and would use low-cost line fuel. It is not deemed practical at most gas line stations to put in steam to enjoy the advantages of the high-speed rotative motion imparted by the turbine.

In an address before the American Institute of Electrical Engineers at Mexico City on August 28, Dr. J. T. Rettaliata of the Allis-Chalmers Manufacturing Company, reported that two main difficulties with the gas turbine have been overcome. An efficient centrifugal gas compressor has been perfected, and materials have been developed which will stand up under 1,600°F temperature. The first large-scale use of a gas turbine in the United States was in connection with the Houdry cracking process, and the first unit was installed only 11 years ago. At present there are 28 of these units operating, although under less severe conditions than would be encountered in a gas-fired turbine driving a gas transmission line pump station. Allis-Chalmers has, however, built a 3,500 hp. gas turbine for the U. S. Navy to operate at 1,500°F. In Switzerland a 2,200 hp. oil-fired unit has been operating on the Swiss Federal Railways, and two large gas-turbine locomotives now are being built in the United States and will be on the rails next year. These units will burn pulverized coal and will drive electric generators. The compressor to supply air for combustion of the coal will have 20 stages. One of these units is being built by Allis-Chalmers is rated at about 3750 hp. and the other by General Electric Co. is rated at about 4800 hp.

With either electric drive or with gas turbine drive, the "automatic pipe line pump station" can be achieved. With electric drive the seal problem is solved by the use of a "sealed in" unit. A second problem concerning which some engineers have expressed concern is the loss of lubricating oil into the gas stream when operating at high gas-line pressures on the order of 800 psi. Much progress has been made in the lubrication of centrifugal compressors in recent years by building oil pumps into the unit so that the oil always is under pressure. Standby equipment also is provided to insure an adequate supply of oil to the bearings at all times. At pressures up to 300 psi discharge gas is free of oil contamination.

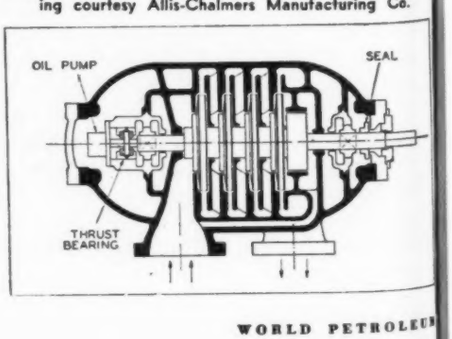
Of more concrete interest to the average oil refiner and natural gasoline manufacturer than the gas line pumping is the development of centrifugal compressors for refrigeration and for the pumping of the growing quantities of air and hydrocarbon gases involved in modern processes.

A few weeks ago Lester M. Goldsmith, chief engineer of Atlantic Refining Co., and his assistant, John M. Glasby, were at the Carrier Corporation plant in Syracuse, N. Y., to witness testing of the first turbine-driven centrifugal compressor built for oil refinery use as a refrigerating machine employing propane. At the time the Atlantic unit was being block-tested, a second gas compressor was being assembled by Carrier for similar duty at the Humble Oil & Refining Company plant at Baytown, Texas. Predictions are that the Atlantic compressor is the forerunner of many because in the oil refinery prime mover limitations are not the same as on a gas transmission line. Steam is available for turbine operations and, in many instances, the power may be considered to be free or nearly so, since the exhaust steam from the turbine may be used for process work.

There are only a few predecessors of the Atlantic unit in use in the manufacturing branch of the oil industry. A centrifugal compressor has been in use at one refinery for several years but has not used propane as a refrigerant. The La Gloria Corp. gasoline plant at Falfurrias, Texas, and Shell Oil Co. at Houston, have used centrifugal compressors to refrigerate lean oil. Isobutane and butane are used as the refrigerant. Other forerunners of the Atlantic installation are the wartime rubber plants in which centrifugal compressors were used for gas compression and refrigeration.

Centrifugal compressor manufacturers say that their units are essentially for large-volume installations. Where horsepower requirements fall much below 500, the reciprocating compressor still is more economical. This generalization may

Cross section of centrifugal compressor with single, full-pressure shaft seal designed for gas pipeline work. Drawing courtesy Allis-Chalmers Manufacturing Co.



not be true, however, under special conditions where the steam turbine acts as a reducing valve, providing free power, in the refrigerating cycle or where it is necessary to keep the air or gas free of contamination with oil.

At present commercially built compressors are not equipped with cases designed for pressures much above 300 psig, but there is no reason why any reasonable working pressure desired may not be made available. The gas line compressors previously mentioned will require stronger cases.

E. B. Badger & Sons Company is installing the Carrier unit in the Atlantic plant for the refrigerating cycle in a new dewaxing plant. The compressor is a five-stage, 2,000-cfm unit which will operate at 21 psia inlet pressure at —22°F and 195 psia discharge. It is directly connected to a 1,085 hp. steam turbine which will operate on 600-pound, 700° steam with 15-pound exhaust. Compressor will normally require 975 bhp to run at about 9,400 rpm. During the block test at Syracuse witnessed by the Atlantic officials the unit was operated at 11,000 rpm. The combined turbine and compressor occupy only 75 square feet of floor space, 5 by 15 feet, and substitutes for three 600 hp. reciprocating units. One of the selling points made by the centrifugal compressor manufacturers is that first cost is low because the machine is compact, lighter in weight and hence requires less footings and less building to house it. Investment is on the order of 50 to 60 percent of reciprocating compressors.

The centrifugal gas compressor is not the reverse of a steam turbine which uses the kinetic energy of an expanding fluid to create power. In the gas compressor the wheel imparts velocity to the gas by centrifugal motion. At the discharge tip of the impeller, the energy, due to velocity, is converted to pressure as it passes through diffusers and return channels installed between each stage. As gas velocity decreases in passing through the channels, pressure increases. Entering the next stage the process is repeated and hence more pressure added. The wheel in each stage is smaller in width than the preceding one to compensate for the smaller space occupied by the compressed gas. In theory there is no limit to the number of wheels which may be installed and no limit to the final pressures achieved. Actually, however, most manufacturers limit their gas compressors to four or five wheels per unit and install intercoolers between compressors to increase efficiency by eliminating much of the heat of compression. Speed of the wheels in modern compressors ranges from 4,000 to 10,000 rpm, and peripheral speed goes up to 750 feet per second. This is achieved without danger by the use of special alloys.

In the centrifugal compressor there is little or no vibration or pulsation of discharge. Only points of wear are the two large, rugged main bearings and a thrust bearing. There is no metal to metal contact between the metal labyrinths and the rotor. No valves are required.

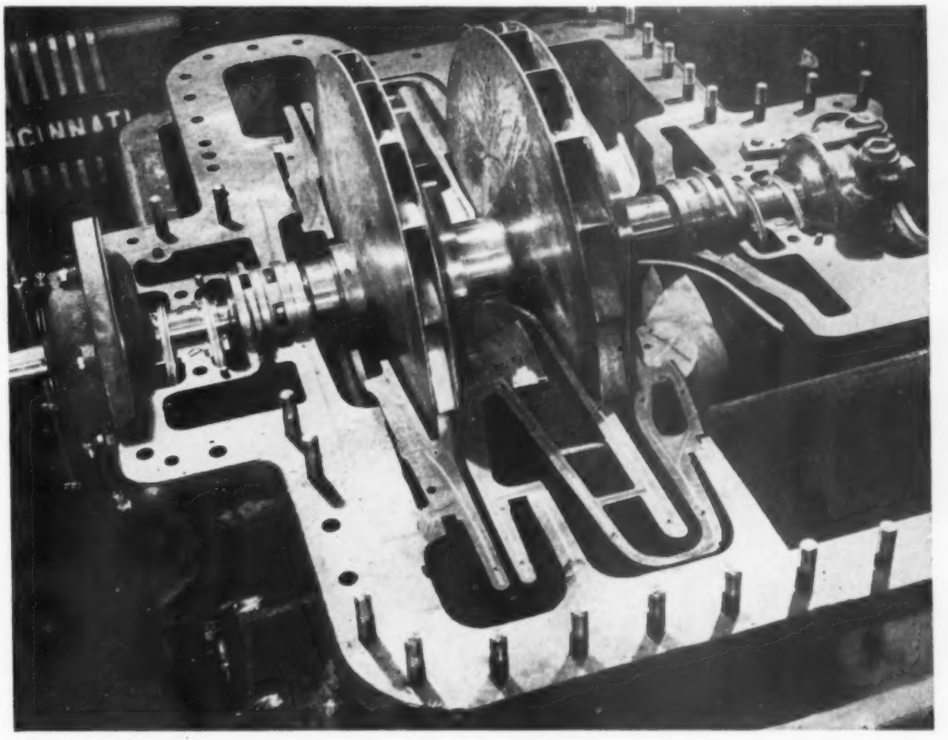
The ratio of compression obtainable with centrifugals depends on the molecular weight and temperature of the inlet gas. Carrier has stated the following tabulation of compression ratios obtainable on 100°F gases:

Type Gas	Three Wheels	Four Wheels
Natural Gas	1.75	2.10
Air	2.30	2.85
Propane	3.85	6.00
Butane	6.02	9.00

For higher pressure ratios, installation of intercoolers will increase efficiencies.

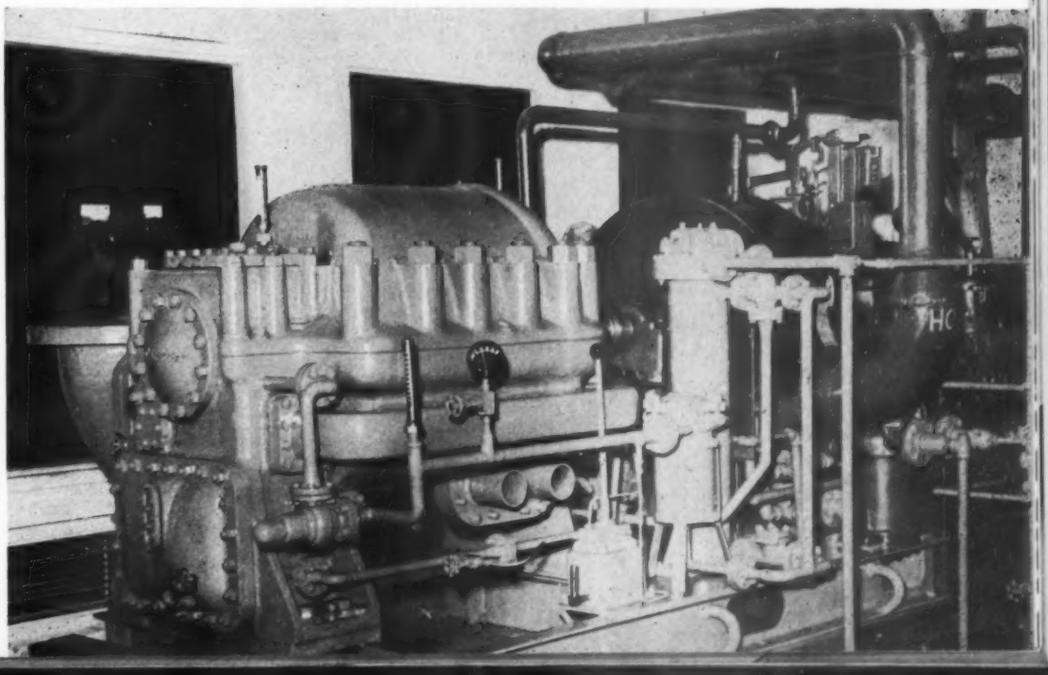
An interesting feature of the centrifugal gas compressor is that efficiency does not fall sharply at part load. In some designs efficiency may be approximately as high with a 50 percent load factor as when operated at full load.

Having got a foot in the door at oil refineries, the centrifugal compressor manufacturer is eyeing the natural gasoline and cycling plants with covetous eyes. These plants are traditionally the largest users of compressors in the oil industry. If the salesmen can prove their point, they can see a rich market for future expansion.



Two-stage Carrier compressor showing construction of wheels and labyrinths.

Five-stage propane compressor built for Atlantic Refining Company with turbine drive assembled for test run at Carrier factory.



MEXICO SETTLES FINAL EXPROPRIATION CLAIMS

CONFIRMING reports that had been in circulation for some time, though without official authority, President Miguel Aleman announced to the nation at the opening of Congress on Sept. 1 the final settlement of the claim of Royal Dutch-Shell interests, which has been a subject of controversy since the date of expropriation, March 18, 1938. The claim was based upon the loss suffered by the Mexican Eagle Oil Company, Royal Dutch-Shell subsidiary, through seizure of its properties on that date.

Holdings of El Aguila were the most extensive and valuable of those under foreign ownership which were expropriated by decree of the then President Lazaro Cardenas. They included the larger part of the great Poza Rica field where production was rapidly expanding at the time, other fields, a refinery at Mexico City, pipelines, storage, port and marketing facilities and ships. Diplomatic protests from the United States, Britain and the Netherlands, whose citizens had summarily been deprived of investments amounting to some hundreds of millions of dollars, elicited a promise from the Mexican government that payment would be made for the properties taken, but no progress was made in this direction for several years owing to the wide divergence between the ideas of the two parties as to values. Under pressure from the State Department of the United States the American companies submitted their claims to arbitration in 1942. This resulted in an agreement by Mexico to pay these companies a total of $23,995,991 in five annual instalments beginning July 1, 1942. Final payment of $4,085,000 was made on Sept. 30, 1947. Discussion of the Royal Dutch-Shell claim has gone on intermittently since early in 1946.

Terms of the settlement as announced by President Aleman provide for the payment by Mexico of $81,500,000 over a period of fifteen years with interest of three percent from the date of expropriation. In commenting upon the agreement the President said: "A definite and final settlement has been reached of all the commitments made by the government when it expropriated the oil industry for the benefit of the nation. Negotiations were carried on between the national oil administration and representatives of El Aguila and its subsidiaries. A satisfactory agreement was reached on the basis of a much lower and more just valuation of the expropriated properties than had been considered in prior negotiations."

While the amount asked by the oil company was not mentioned, the final sentence quoted above undoubtedly refers to the figure of $250,000,000 which the company had set as the minimum value of its properties. On this basis Aguila has fared somewhat better than the United States companies, as the latter had placed the value of their properties at roundly $150,000,000.

Apparently irked by comment of the Mexico City newspaper "Excelsior" expressing doubt as to the ability of Pemex to make the agreed payment to Mexican Eagle, Senator Bermudez, Pemex chief, presented his reply in the form of full-page advertisements in the press. The advertisements declared in substance that the company is well able to meet the payment, that by September 24 it would have paid into the national treasury 43,664,591 pesos, approximately $8,732,918, on account of the tax imposed for payment of oil indemnifications. This payment, it was stated, covers the period from November 1, 1946, to June 30, 1947, and total payments to the government in various taxes since President Aleman took office on December 1 last amounted to 184,269,648 pesos ($36,853,929). Furthermore, it was stated that the company was paying its bills promptly and enjoyed excellent credit at home and abroad. The statement continued that the largest amount the oil companies ever paid in taxes was 87,678,191 pesos ($17,535,638) in 1922. In 1937, the last full year when they were in control, their tax payment amounted to 52,469,622 pesos ($10,493,922). The advertisement, which was in the form of an open letter to Rodrigo de Llano, publisher of Excelsior, called upon him to give "effective aid in combatting the army of defeatist elements who think that Mexico has failed. These elements, lacking faith and confidence, constitute a blight whose extermination will prompt rejoicing by the Mexican people."

Aside from his announcement of the settlement with Mexican Eagle, President Aleman in his message to Congress referred briefly to oil in the following words:

"The object of Petroleos Mexicanos has been administrative organization and the development of a program of exploration, including the drilling of test wells with the aim of discovering new deposits. One hundred well sites have now been located in northeastern Mexico (near the Texas border in Nuevo Leon and Tamaulipas), the region between Tampico and Tuxpan (on the Gulf coast), the Southern zone (mostly in Vera Cruz), and in Chihuahua and Baja California. Thirty wells were drilled (during the period of this report from December 4, 1946, to August 31, 1947) of which 21 were productive, with a potential daily yield of 13,000 barrels, and three more are being completed at La Mision, Tamaulipas. Oil production during this period was 41,120,000 and the refineries treated 34,200,000 barrels.

"Home demand for oil and its products has increased over that of the previous executive period (August 31, 1945—September 1, 1946), the average monthly distribution being 106,000,000 liters, and the sales revenue increased to 15,500,000 pesos. The monthly sales yield from exports averaged 1,800,000 pesos and that from taxes 2,600,000 pesos. A saving of 3,500,000 pesos was attained in the buying of equipment and raw materials. Restoration of the oil fleet was started and efforts are being made to improve oil distribution throughout the country. The old problem of royalties is on its way to solution. As oil is indispensable to the economic development of the country, efforts are being made to obtain abundant supplies and later exports will be accelerated to bring in funds that are essential to our economic reenforcement."

Pemex has confirmed reports published in the United States to the effect that a contract has been made with J. Edward Jones, Sugar Field Oil Co., Baton Rouge, Louisiana, for the drilling of 100 wildcat tests in various parts of Mexico and indicated that the deal is on a cost plus basis and involves about $20,000,000 U. S. It is understood that Mexican government bonds figure in this transaction, supposedly as a guarantee. Denying that contracts have been made with other United States drilling companies, Pemex admitted that it is not out of the question that such contracts may be placed.

Completion of the Eagle agreement has revived speculation that began almost with the expropriation on March 18, 1938 as to whether or not foreigners, physically or with capital, or both, will be permitted to engage directly in the oil business in Mexico. That has brought reiteration of the statement, made officially and otherwise in Mexico from time to time, that Mexican law plainly bans foreigners or their money from engaging in the oil business in Mexico, that that business is in charge of Pemex as the custodian of national oil property and that the oil business in Mexico is reserved for Mexican citizens. Foreigners may deal with it as buyers, sell equipment, or to hire out to Pemex as technicians or drillers.

Exhaustion of Mexico's oil is a most remote possibility, Senator Antonio J. Bermudez, Pemex managing director, declared in a Mexico City press interview. Asserting that Mexico's oil production has increased of late and that its output is much superior to that of 1937, he reiterated the program for better distribution at home, saying that this will stimulate industrialization.

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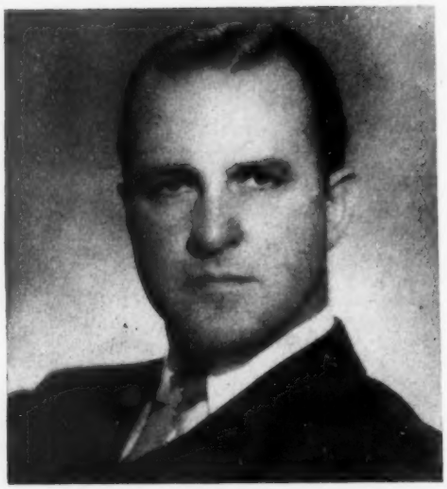

Jay P. Gould

JAY P. GOULD has been appointed chief engineer of drilling and production and assistant to General Manager George Heseldin of Iraq Petroleum Company, Ltd. His headquarters will be in Tripoli, Republic of Lebanon. He will leave New York about November 18 for London, where he will visit the home office. From there he will go to Tripoli. Gould has been well control design engineer for Baash-Ross Tool Company. Prior to that he was chief engineer in charge of drilling and production for the oil producing properties of Norris Stamping and Manufacturing Company, Los Angeles.

World Congress for 1950

Members of the permanent council of the World Petroleum Congress held a meeting in London on July 21 which was attended by representatives of Great Britain, France, Belgium, Holland and the United States. Discussion related to the third World Congress for which 1950 was selected as a suitable date. Members expressed a preference for holding the meeting in the United States but a definite decision was left for further determination. As originally planned the Congress was to convene triennially. The first meeting was held in London in 1933 and the second in Paris in 1937. The third was scheduled to be held in Berlin in 1940 but was voided by the outbreak of war.

Color Film Shows Engine Construction

Acting for Crossley Bros. Ltd., of Manchester, England, makers of two and four-cycle diesel engines, National Film Agency has prepared a film in technicolor illustrating the design, construction and operation of the company's latest type of two-cycle engine fitted with exhaust pulse pressure charging, loop scavenge and port control of the air inlet and exhaust discharge processes.

The film is divided into two main portions, one showing the erection of the engines and the performance of various vessels in which they are installed, and the other portion a diagrammatic explanation of its various special features. In the preparation of this latter portion over 12,000 drawings were employed.

Interior views taken at the works show the erection of a medium-sized six-cylinder engine from start to finish. The fitting of the separate scavening pump is also shown, this being located at the forward end of the engine.

The "animated" section of the film explains the principles of loop scavenge and exhaust pulse pressure charging, the latter being one of the latest developments in two-cycle engine design. It is claimed that a scavenging effect of 90 percent is attained by this method, which means more efficient combustion combined with a higher load carrying capacity.

The outside views show many types of vessels fitted with Crossley engines taken in the course of their ordinary operations.

Petroleum Board to be Dissolved

The British Petroleum Board is to be dissolved on December 31, 1947. The board, which is a voluntary association of companies distributing oil in the United Kingdom, was formed at the request of the Government in 1933 to insure maintenance of oil supplies in the event of war. The agreement provided for dissolution not more than two years after the end of the emergency.

Control of prices and of imports will remain for the time being. Two Oil Industry committees will cooperate with the government. One committee will deal with the supply, refining and distribution of oil in the United Kingdom; and the other with oil questions in general. The Minister of Fuel and Power proposes to set up a consumers' council composed of representatives of the oil industry, consumers, manufacturers of oil using equipment, and of labor. The dissolution of the Petroleum Board will not of course, affect petrol rationing.

Venezuelan Production

Production of crude oil in Venezuela during the month of July amounted to 37,003,397 barrels, an average of 1,193,658 barrels daily. As compared with June, this daily average is higher by 24,451 barrels. Exports for the month were 33,920,605 barrels. Production by companies is shown in the following table:

Company	West	East	Total
Creole	13,703,585	4,711,136	18,414,721
Mene Grande	1,791,742	4,666,454	6,458,196
Shell	10,328,202	—	10,328,202
Consolidada	—	649,910	649,910
Socony	—	905,859	905,859
Texas	19,731	171,576	191,307
B. C. O.	38,636	—	38,636
Orinoco	8,098	—	8,098
Guasare	—	—	—
Phillips	—	1,346	1,346
S. A. P. Las Mercedes	—	1,978	1,978
Atlantic	—	5,144	5,144
Total Barrels	25,889,994	11,113,403	37,003,397
Export Barrels			33,920,605

Britons Fear Fuel Oil Shortage

With the scarcity of fuel oil assuming more and more serious proportions and with the government's plans for a further drastic cut in imports, the outlook for extensive conversion from coal to oil in Britain appears exceedingly dubious. At the time of the fuel crisis last winter a changeover was urged on the strength of the forecast that the shortage on coal would continue for at least a year and possibly longer. In official quarters this proposal was approved and was furthered by projected changes in the case of railways and power plants.

Since that time at least 5,000 enterprises in all parts of the country have filed applications for conversion which, if granted, would call for some 20,000,000 tons of oil per year. The impossibility of obtaining any such quantity, or the equipment for using it, is now evident, and Fuel Minister Shinwell has reverted to his former position that 5,000,000 tons of fuel oil is all that can be imported, plus a possible one million tons to provide for cases where exceptionally large coal savings can be effected.

Little confidence is felt in the assurance that sufficient coal will be provided to cover "normal" requirements. A large part of the public looks forward with apprehension to a repetition, though perhaps in less acute form, of the suffering and interruption of industrial operations that took place last winter. They have the conviction that coal-oil conversion is just as vital to British economy as is the renewal of mining equipment and generating plant.

Recognized by Llloyds

Whessoe Ltd., Darlington, England, has been recognized by Lloyds as an approved manufacturer of Class I Welded Pressure Vessels by fusion welding methods. The Lloyds certificate means that Whessoe has facilities for the design, manufacture and stress relief of large vessels of heavy wall thickness for refining and chemical industries. Whessoe services now include radio-graphic examination.

Peruvian President Vetoes Oil Bill

The bill passed by the Peruvian Petroleum Company has been vetoed by the President and returned to the Congress for revision. As originally passed, the bill provided that the government should hold 75 percent and Peruvian nationals the remaining 25 percent of the shares of the company, which would have had very broad powers to engage in all phases of oil operation and could have been liquidated only by Congress.

Puerto Rico Exploration

Puerto Rico Industrial Development Company's new exploration program is progressing quite satisfactorily according to the latest reports. The reconnaissance seismic survey is being conducted for PRIDC by United Geophysical Company, Inc. United personnel on the crew include W. H. Myers, J. J. Freeburg, P. J. Guthridge, A. E. Ross, W. D. Faurot and N. R. Phillips.

Formosan Refinery Resumes

Reports from Chinese sources state that rehabilitation of the refinery at Taichung, Taiwan (Formosa), is under way and that the plant is now working 6,000 barrels of crude daily. It is expected that runs will be increased to 17,000 barrels daily by the end of next year. The refinery has skimming, cracking and lubricating oil facilities. Its crude supply is drawn from the Persian Gulf.

Ecuador's 1946 Operations

Production of crude oil in Ecuador for the year 1946 was 2,322,000 barrels as compared with 2,624,000 in the year preceding. Natural gasoline production was 40,690 barrels. Exports of crude amounted to 1,229,839 barrels consisting of shipments to Uruguay and Argentina. Imports of products were 88,962 barrels.

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OIL COMPANY STAFF CHANGES

P. C. Spencer

R. F. Baity

P. C. SPENCER, general counsel of Sinclair Oil Corp. since 1946, has been elected president of Sinclair Refining Co. He succeeds H. F. Sinclair, founder of the company, who resigned. Mr. Sinclair announced that the election was the first of a number of changes which will place younger men in the top positions in Sinclair companies. As president of Sinclair Refining Co., Mr. Spencer will head the largest subsidiary of Sinclair Oil Corp. and be in charge of crude and products pipeline transportation as well as refining.

Mr. Spencer entered the oil industry in 1922 with Producers & Refiners Corp. which later became a subsidiary of Prairie Oil & Gas Co. He became active in the Sinclair organization when Sinclair acquired the Prairie companies and moved to New York in 1934. He has held executive positions in several natural gas companies for a number of years.

R. N. GILES, superintendent of technical service in the Whiting, Ind., laboratories of Standard Oil Company (Indiana), has been promoted to director of technical service with headquarters in the research department at the general office in Chicago. He will be responsible for direction of technical service activities at all of the Standard of Indiana refineries. Dr. Giles joined Standard Oil in 1930 after graduate work at Ohio State University. C. R. Harte, assistant superintendent of technical service at Whiting, succeeds Dr. Giles. W. F. Meehan, a group leader, was advanced to fill the post vacated by Dr. Harte.

PAUL M. WADDILL, manager of licensee service section of Phillips Petroleum Company's chemical engineering department, has been appointed to act as liaison for the company's refining department with other refiners. In this new capacity Waddill will be available for consultation on the company's refinery engineering and operating problems.

E. W. ALLGOWER has been appointed treasurer of The Standard Oil Company (Ohio) and various of its subsidiaries. For the past eight years Mr. Allgower, who is a veteran of more than 30 years' service with the company, has served as assistant treasurer.

R. F. BAITY, assistant general manager of sales for Standard Oil Company (Indiana), has been elected a director. He is the first former service station attendant to reach the ranks of top management of the company. His election followed the resignation of L. C. Welch, general manager of the lubricating, sales and technical service departments, who has retired.

Mr. Baity joined Standard of Indiana in 1920 as a service station attendant at Indianapolis, Ind., and worked his way up to division sales there. After filling various assignments in the field, Mr. Baity came to the general office in 1941 as assistant general manager of sales for the western division and in 1944 was transferred to assistant general manager of sales for the central division. In 1945 he was promoted to assistant general manager of sales for the general sales division.

LT. COMMANDER LAURENCE C. BERGQUIST, USNR, has been awarded the Legion of Merit and authorized to wear the Combat "V" for "exceptionally meritorious conduct" in the Gilberts-Marshalls area in 1944-45. Mr. Bergquist is a member of the foreign marketing staff of the Standard-Vacuum Oil Company. He was cited for his leadership and initiative in organizing, coordinating and administering military government activities affecting more than 6,000 natives in the Marshalls groups.

STANDARD OF CALIFORNIA has announced the appointment of three assistant managers in the department on organization. They are C. E. Braun, L. S. Fish and D. H. Voorhies. The three become the first assistant managers since the formation of the department 16 years ago.

Mr. Braun has been with Standard since 1914. His first position was in the sales accounting division. He joined the department on organization in 1931. During the war his services were requested on numerous occasions by the government to supervise reorganization of important military projects. He recently conducted a complete reorganization of the Community Chest of San Francisco.

Mr. Fish has been with Standard 26 years. He served as staff assistant in the engineering and manufacturing departments and as manager of the manufacturing department's organization and cost control division. He was transferred to the department on organization in 1935. In 1939 he was "loaned" to Standard Graduate School of Business where he assisted in a research study of the management policies and practices of a number of leading industrial corporations. The results of this study appeared in book form under the title, "Top-Management Organization and Control." During the war he also served "on loan" as consultant with the WPB and PAW in Washington and as adviser to U. S. Element of Allied Control Authority for Germany.

C. H. WAGNER has been elected president of the American Oil Co. succeeding the late E. G. McKeever. Mr. Wagner has been engaged in oil industry sales activities since 1919 when he became a lubrication engineer for Standard Oil Co. of Indiana. By 1935 he had risen to assistant general manager of sales for the Indiana company. He was transferred to American as general manager in 1937 and was elected vice president and general manager of sales for Lord Baltimore Filling Stations, Inc., and Mexican Petroleum Corp. in 1945.

R. W. McDOWELL has been elected executive vice president of Mid-Continent Petroleum Corp., Tulsa. He has been vice president in charge of marketing operations. Mr. McDowell has been with Mid-Continent for twenty years.

ROBERT I. BROUGHAM has been elected financial vice president of Arabian American Oil Co. He brings with him a wide experience in foreign financial problems acquired through twenty years' service with international oil companies. He was formerly assistant treasurer of Standard-Vacuum Oil Co., treasurer of Creole Petroleum Corp. and more recently foreign exchange manager of the Standard Oil Co. (N. J.) whose operations are worldwide.

R. W. MILLER has been elected vice president of Creole Petroleum Corp. in charge of export sales of crude oil and products. He also handles and coordinates all crude oil purchases and exchanges. Prior to joining Creole, Mr. Miller was associated with other Standard Oil Company (N. J.) interests in the manufacturing and coordination departments. His first position was with the Bayway refinery where he was employed in 1919 upon the completion of sixteen months' service with the Aviation Branch of the U. S. Navy during World War I.

R. W. Miller

Russ Waters

Named Sales Manager

Russ Waters has been made sales manager for the T & C Pump Co., of Avenal, Calif. He will organize a sales department for distribution of the company's products throughout the oil fields. Mr. Waters formerly was with Rockwell Manufacturing Co.

T & C recently made a license agreement with Joshua Hendy Iron Works under which the Hendy T & C pneumatic pump will be manufactured and sold. Three sizes will be manufactured.

Montrose Joins Hughes Tool

Appointment of M. E. Montrose to the executive staff of Hughes Tool Company has been announced by Fred W. Ayres, senior vice president and managing director. Mr. (Monty) Montrose joins Hughes after 27 years of oil industry experience. After thirteen years with General Electric Company, mostly in the Southwest, specializing in oil-well drilling and production activities, he resigned to accept an executive position with Lane Wells Company in Oklahoma when that large oil-well servicing organization was first started. Moving to Houston as district manager in 1938, he was shortly elected director and vice president in charge of all services and sales with headquarters in Los Angeles. For the past two years he has been director, president and general manager of Marion Power Shovel Company in Marion, Ohio.

Mr. Montrose has been active in Nomads, American Petroleum Institute, American Institute of Mining Engineers, American Association of Petroleum Geologists, Petroleum Equipment Suppliers Association and other associated groups in the mining and petroleum industry.

Ladish Changes Name

Ladish Drop Forge Co. of Cudahy, Wis., for over forty years one of the largest producers of steel and alloy forgings for industry, has announced that the corporate name has been changed to Ladish Co. Inclusion of the specialized term "drop forge" in the company name was thought to imply a limitation of products, particularly to users of one of the Ladish major lines, namely, forged and seamless welding pipe fittings.

Backlog Passes $100,000,000

Past its own peacetime record of $80,000,000 as indicated at the end of the first quarter, The M. W. Kellogg Company completed the first half of 1946 with a backlog of more than $100,000,000, it was announced by H. R. Austin, president.

"The present modernization and expansion program of the oil refining industry, which is the most expansive ever undertaken by that major division of our economy, is advancing," Mr. Austin said. Fluid catalytic cracking process units now nearing completion by Kellogg will mean a net increase in cracking capacity of 225,000 barrels per day to the industry. This will bring the overall total capacity of Kellogg-engineered fluid units completed since 1940, when the process was first commercially introduced, to the impressive figure of 700,000 barrels. In addition to its extensive domber of refinery installations in foreign countrie. These include the design and construction of two propane deasphalting units at Haifa, Palestine; several large projects in Canada; and a multiplicity of processing facilities, including fluid catalytic cracking at Amuay, Venezuela.

LESLIE MOSES, formerly general counsel for Fohs Oil Company, has joined Mid States Oil Corp. In his new position Mr. Moses will be located in Shreveport, from which office Mid States handles its East Texas, South Arkansas, Louisiana, Mississippi, Alabama, Georgia and Florida operations.

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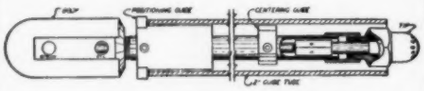

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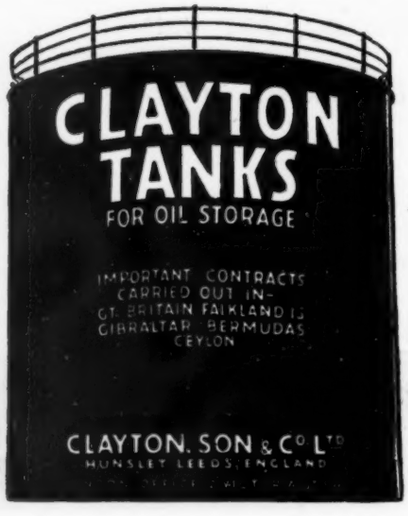

Britain Will Slash Oil Imports

(Continued from page 71)

Taking all these facts into consideration, a reasonable forecast would be that in the near future, most of the petroleum requirements of Great Britain, as well as the rest of Europe, and a large portion of the Far East, will be drawn from Near East fields.

So long as the bulk of Middle East oil has to be shipped by sea from the Persian Gulf, Great Britain is nearer to the Gulf ports of the United States, and the ports of the Caribbean Sea. With the Empire's shortage of tankers it has been considered more economical to ship from American ports even if dollars are required for this, than to ship from Near East ports. Further, it has been claimed by the Minister of Fuel and Power, that actually Near East oil is being sold for dollars to replace United States supplies to the Far East and the Antipodes, and therefore, the balance breaks nearly even.

America at the present time is the largest owner of tankers and its fleet is officially controlled. Its use, therefore, means the expenditure of dollars, and it is only natural that this use should be as limited as possible, which is a further justification of the "short haul" policy.

There would appear to be no immediate prospect of any departure from "austerity" in the consumption of motor fuel in Great Britain, in view of the financial crisis which has given rise, first to reduction and now to abolition of the basic motor fuel ration. How long these austerity conditions will continue can only be a matter for conjecture until such time as the Socialist government will make up its mind about its future policy for recovery.

In 1946, the British Commonwealth was able to produce only 8.7 percent of the country's imports. With the reduction in imports this small percentage will rise but only slightly and the fact remains that at least 90 percent will have to be purchased externally either for sterling or dollars.

During the immediate pre-war years there was a steady increase of about five percent in the yearly consumption of petroleum in Great Britain. If and when conditions become normal it is logical to assume that at least a similar annual increase will be maintained.

Taking an average value for all products of 250 gallons per ton, the consumption in Great Britain was 10.9 million tons in 1938, 15.3 in 1945, 12.9 in 1946 and an estimated amount of 9.7 in 1947 based on the consumption for January to June of this year.

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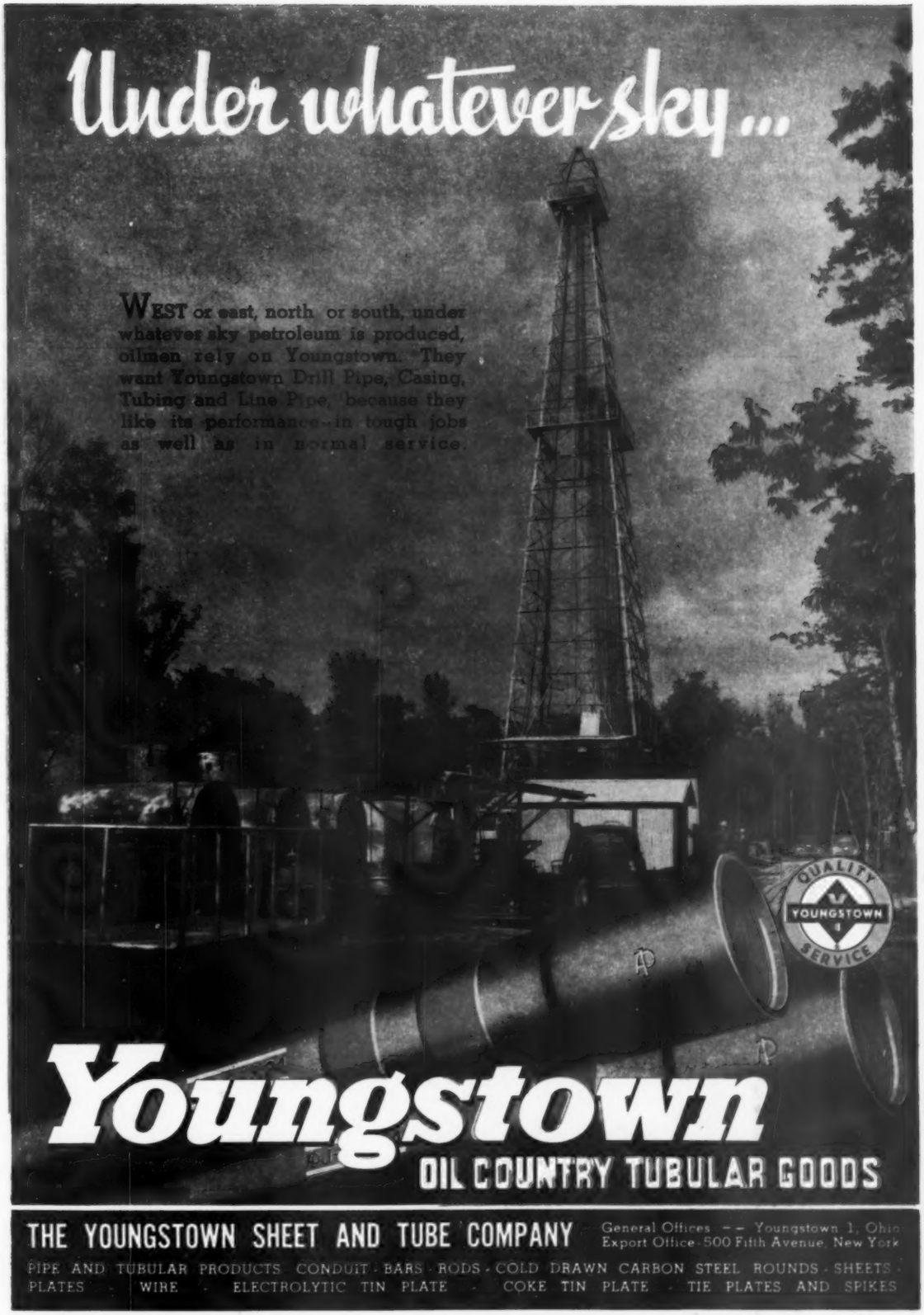
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Aurora Accepts New Unit

Max M. Fisher, vice president of the Aurora Gasoline Co. of Detroit, has formally accepted the new-type fluid catalytic cracking unit which was recently completed and placed in operation in the Aurora refinery.

All guarantees have been met by a substantial margin. The unit, which was developed and designed by Universal Oil Products Company engineers, was constructed by Aurora under U.O.P. supervision. It is the first catalytic cracker built in which reactor and regenerator are housed in a single column, and it embodies a number of other improvements over cat crackers of conventional design.

Table 1

Average Daily Charge	**3900 bbls.**
Yields	**Vol. %**
Gasoline 6-7 RVP	40.7
Recovered Propane-Propylene	4.0
Recovered excess Butane-Butylene	9.2
Heating oil	31.9
Fuel oil	16.1

Catalyst consumption during the first run averaged only 0.24 pound per barrel of fresh charge. Refinery tank yields for the month of July and typical quality of products are shown in the following tables:

Table 2

	Fresh Feed Charge	Gasoline	Heating Oil	Fuel Oil
Gravity, °API	29.9	60.6	31.1	26.6
RVP		6.7		
Total sulfur, wt. %	0.58	0.06	0.36	0.57
Conradson Carbon, wt. %	0.18		0.023 (a)	0.25
Aniline point, °F.	184.3		130.5	167
Viscosity, SUS @ 100°F.	75.0		35.8	55.4
Flash (PM) °F.			184	270
Octane Numbers				
Motor Method, Clear		78		
" " + 3 cc TEL/Gal		86		
Research Method, Clear		91		
" " + 3 cc TEL/Gal		98		
Distillation				
IBP., °F.	535	108	396	556
10%	609	134	452	610
30%	667	169	499	653
50%	711	219	532	678
70%	771	278	565	709
90%	862	352	608	766
95%	909	384	630	785
End Point		415	653	

(a) On 10% Bottoms

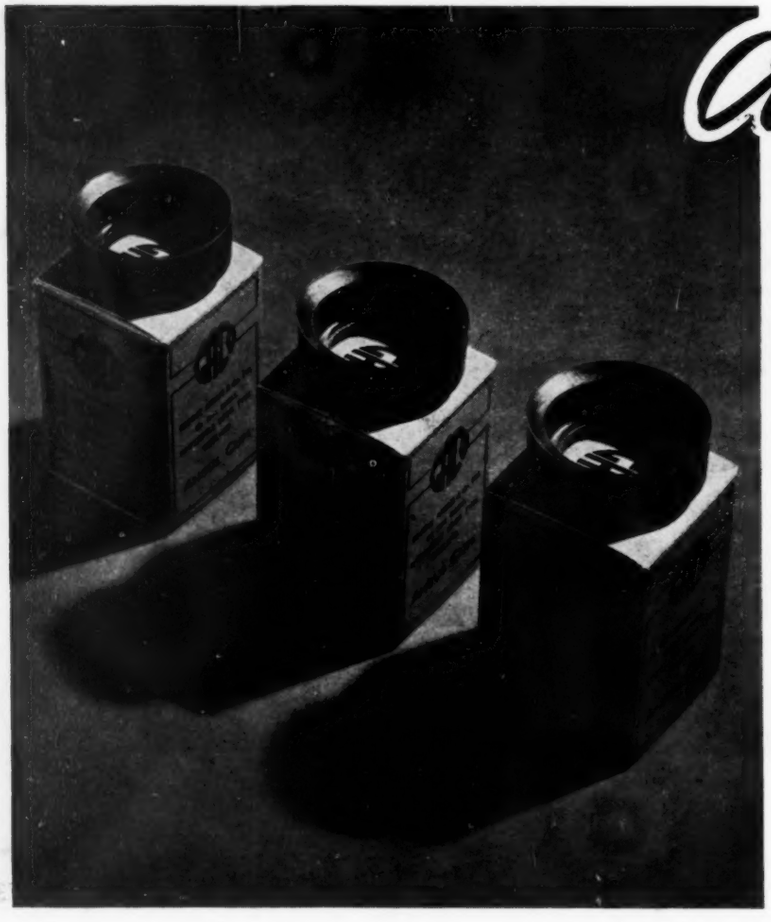
Houdry Marks Tenth Year of Catalyst Manufacturing

An important milestone in the progress of catalytic refining was passed when Houdry Process Corporation completed its tenth year of catalyst manufacturing recently, Arthur V. Danner, Houdry executive vice-president, has pointed out.

Ten years ago, a group of twenty-one picked Houdry technicians began the manufacture of the first commercial catalyst to be used in catalytic cracking. Under the supervision of A. R. Worrall, manager of Houdry's extensive catalyst-manufacturing facilities in Marcus Hook, Pa., and Paulsboro, N. J., this group of pioneers filled the first order for catalyst for the Sun Oil Company's fixed-bed plant which began operations in early 1937. This initial order called for 200,000 liters of a hydrated silicate of alumina obtained in the form of natural clay.

One of Houdry's greatest contributions to the war effort was the development and manufacture of synthetic catalyst for catalytic cracking. In 1940 Houdry started manufacturing the first commercial synthetic catalyst to be used in catalytic cracking. This development served mightily in the production of highest quality aviation base stock providing better octane rating and higher yield per barrel of charge stock.

Originally, catalyst was manufactured only in a small plant in Marcus Hook, Pa., but the demand increased to the point that new facilities were constructed in Paulsboro, N. J., in 1940. So important was the synthetic catalyst that plant capacity was doubled in 1941 and again in 1943. So efficient has been manufacturing procedure that never have a licensee's operations been delayed for lack of catalyst. Of the original group of pioneers, fourteen are still employed by Houdry Process Corporation. Two others died in service during the war.



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Standing loss per year	1,600 bbls.	120 bbls.
Pumping loss	1,536 bbls.	0 bbls.
Total annual evaporation loss ..	3,136 bbls.	120 bbls.
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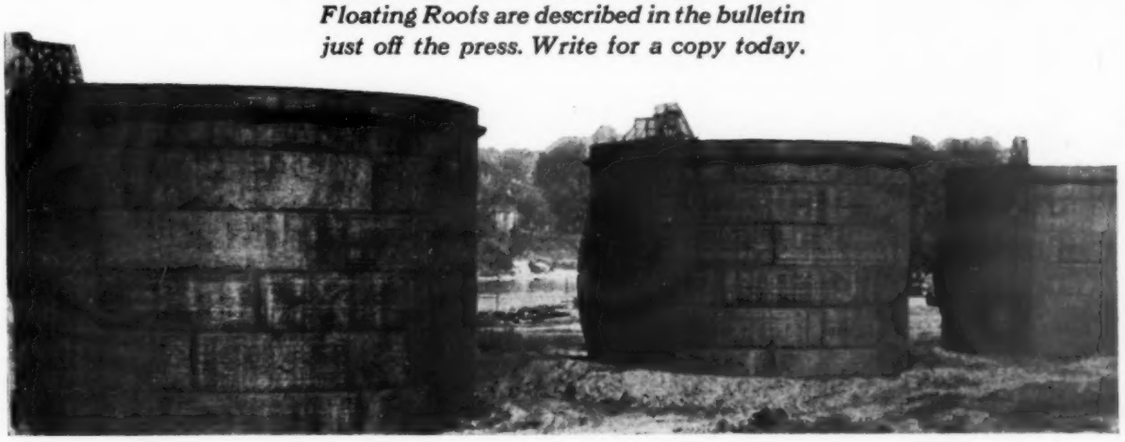

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Unit Rig Sales Manager

T. A. (Tom) Ramey has been appointed sales manager of Unit Rig and Equipment Co., according to an announcement by President William Guier. For the past 13 years Mr. Ramey has been connected with the National Supply Co. He comes to Tulsa from Fort Worth, Texas, where he was manager of sales and service in the Rotary Drilling equipment division.

Erratum

A number of typographical errors appeared in a table on page 74 of the Annual Refinery Issue of WORLD PETROLEUM in an article titled "Mercaptan Extraction with Unisol Process" by K. M. Brown of Universal Oil Products Co., Chicago. The tabulation in its correct form is given below:

Predicts Increased Diesel Use

Increased usage of the diesel engine, due to the growing shortage in America of all types of engine fuel, is predicted by Gordon Lefebvre, president and general manager of The Cooper-Bessemer Corp., Mount Vernon, Ohio. At a recent meeting of members of the Diesel Engine Manufacturers Association in Chicago, he urged the industry to take cognizance of the fuel situation and to redouble its efforts to make American industry conscious of the many new functions which the diesel is capable of accomplishing at greater fuel savings than have ever before been possible.

"It may seem incongruous to predict that an engine which burns fuel oil will find greater use in the midst of an oil shortage which is already in evidence in some sections of the nation," Mr. Lefebvre declared, "yet when the whole American power picture is analyzed, it should be quite apparent that when other types of fuel are equally short in supply, the power that can be most efficiently produced is the one that will be most generally adopted."

Spheroid Booklet

The publication of a new sixteen-page booklet, "The Hortonspheroid and Hemispheroid" has been announced by the Chicago Bridge & Iron Company, Chicago, Ill. This booklet describes the reduction of evaporation losses from motor and natural gasolines by storing them in Hortonspheroids or Hemispheroids. A standard capacity table indicates the operating pressures available for each size of vessel. Cutaway drawings included in the booklet show the general design of the noded and smooth Hortonspheroid and the noded and plain Hemispheroid. A copy of the booklet will be sent on request.

Typical Average Mercaptan Sulfur Reduction and Tetraethyl Lead Susceptibility Improvement of Commercially Unisol Treated Gasolines

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Boiling Range of Gasoline, °F.	92-405				110-247		100-364		133-261		95-404		89-399		90-400		100-372	
	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated	Raw	Treated
Total Sulfur, % W	0.530	0.260	0.06	0.05	0.28	0.10	0.05	0.04	0.32	—	0.14	0.09	0.15	0.11	0.157	0.094	0.32	0.23
Mercaptan Sulfur, % W	0.340	0.004	0.014	0.0000	0.118	0.001	0.01	0.0017	0.17	0.0005	0.05	0.0007	0.08	0.0007	0.065	0.004	0.092	0.003
Mercaptan Reduction, %	—	98.8	—	99.9+	—	99.1	—	—	—	99.7	—	98.6	—	99.1	—	94	—	—
Octane Number, F-2																		
Clear	69.5	70.6	68.7	68.7	75	76	67.0	68.4	73.2	74.5	69.8	70.3	67.6	67.8	71.8	71.6	70.9	71.4
Plue 1 cc TEL Gal.	71.8	73.7	74.1	74.8	78	80.1	73.2	74.7	75.9	77.9	73.6	75.4	73.0	74.5	75.8	76.5	75.0	75.5
Plus 3 cc TEL/Gal.,	73.7	76.6	77.8	78.4	80	83	78.0	79.7	76.9	79.9	77.5	79.3	75.3	77.3	80.8	81.8	77.4	78.9
Cents per barrel savings in TEL at F-1 octane number attainable with 3 cc TEL on untreated gasoline	—	15.0	—	6.0	—	15.5	—	7.2	—	15.9	—	8.7	—	13.2	—	3.0	—	9.1
Octane Number F-1																		
Clear													76.8[1]	76.8[1]	78.8	78.7		
1													83.5	84.5	83.9	86.7		
3													87.5	89.3	88.2	90.0		

1) Spot check—not average data

NH
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Our range of SPECIALISED PRODUCTIONS for the OIL INDUSTRY includes CAST & FORGED STEEL, CAST IRON & GUNMETAL, etc., GATE, STOP & CHECK VALVES for Low, Medium and High Pressures and temperatures, and for Water, Steam, Oil, Air & Gas, etc., Services.
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N. J. Herman Blaine Johnston E. F. Shiels

New Ideco Sales Personnel

G. W. Walton, machinery and export vice president of International Derrick & Equipment Co. has announced four changes in his sales personnel. E. F. Shiels has been appointed sales engineer, machinery division at Dallas. N. J. Herman takes up a similar position in the Ideco division. Blaine Johnston, Jr., becomes sales engineer in the export machinery division.

In the direct sales division headed by Vice President T. D. Collins, a new sales appointment is Don J. Shaw who will handle equipment sales in Texas, Louisiana and Mississippi.

Du Pont Names District Managers

Five district offices have been designated and managers named as plans progress for the Du Pont Company to market tetraethyl lead beginning Jan. 1, 1948. A complete petroleum chemicals service laboratory will be set up in each district, according to an announcement by Ray E. Miller, director of sales.

Du Pont has been manufacturing tetraethyl lead at Deepwater Point, N. J., for the past 24 years. Its present contract with the Ethyl Corp. expires at the end of 1947, after which date these anti-knock compounds will be sold direct to the oil refining industry through Du Pont's expanding petroleum chemicals division.

District headquarters will be at: Tulsa with Charles Wirth III as manager; Houston, with Joseph A. Hyland as manager; Los Angeles, with David H. Conklin as manager; Chicago, with Earl G. Bennett as manager, and Wilmington, with Norman Kent as manager.

Economic Process Comparison

The economic relationship of Alkylation and Polymerization and their effect on refinery earnings in the present day market, is the subject of a detailed study in the current issue of the house magazine of The M. W. Kellogg Company. Analyzing the question of which of the two processes is best suited to an individual refinery location, the article presents a detailed study showing the relative economics of both processes in five typical refining locations in the United States.

Included in the presentation are specially compiled nomographic charts which enable any refiner to apply his own price structure to the alkylation and polymerization processes, and so determine actual manufacturing costs for his individual set-up. "Alkylation and Polymerization," the article points out in conclusion, "both conform admirably to the refining industry's own desire to conserve petroleum, and are well adapted to meet the future challenge of higher octane motor fuel. However, the commercial application of any process regardless of improved results must be justified on an economic basis."

British Museum Requests Copies of Hughes Tool Ads

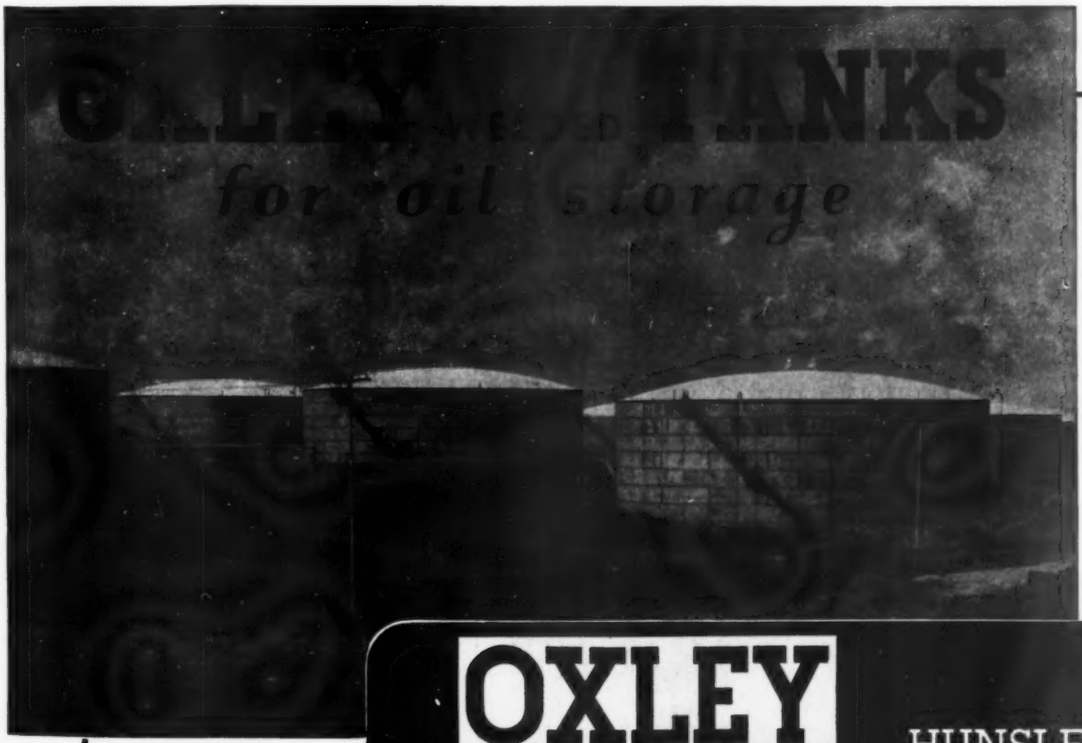
The British Museum of Natural History, in a letter to the Hughes Tool Co., has requested reproductions of a series of Hughes Tool Co. advertisements that appeared this past year in oil magazines.

The advertisements, done in full color, depict the story of plant and animal life, their evolution and mutation through the periods millions of years ago.

Produced by Wilhelm-Laughlin-Wilson, advertising agency, and painted by John Pemberton Cowan of that firm, the ten paintings have caused favorable comment in oil, archaeological and educational circles. Nearly five thousand requests for reproductions of the illustrations have been received by the Hughes Tool Co. and its agency from all parts of the world, including Latin America, Netherlands, France, China, India and the Middle East.

Houdry Buys WAA Catalyst Plant

The modern catalyst manufacturing plant at Paulsboro, N. J., operated by Houdry Process Corp. since 1942 under lease with the government, has been purchased by Houdry from War Assets Administration. The plant is a duplicate of the original Houdry plant which manufactured the world's first commercial cracking catalyst in 1940.



The illustration shows a group of Arc Welded Tanks for oil storage erected by us in Trinidad. All the work was executed under the supervision of our own engineers on the site.

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W84

Exploitation of Natural Gas

(Continued from page 41)

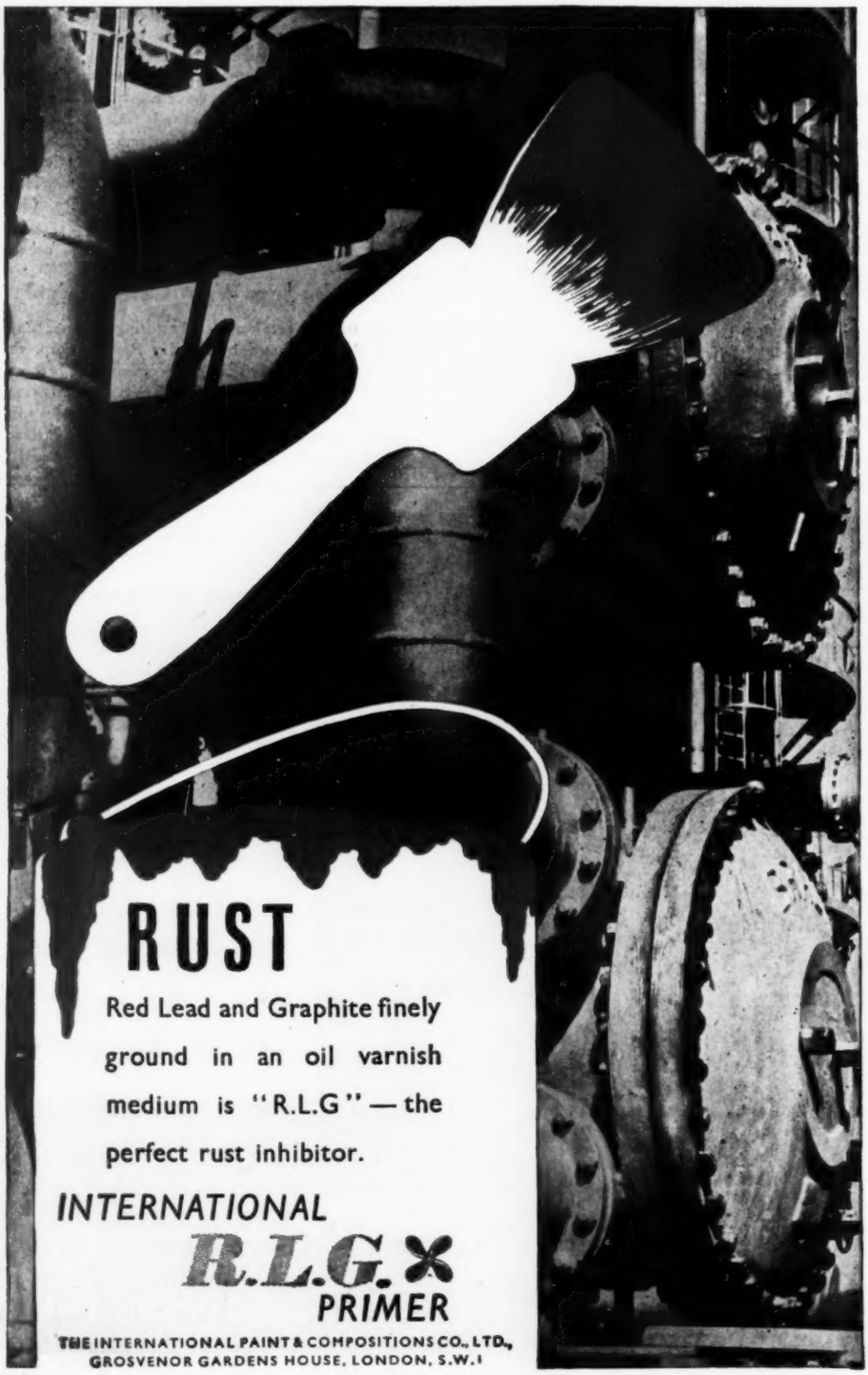
vided at a cost of several million francs. While awaiting the completion of this system, insulating joints which divide the pipelines into electrically discontinuous sections have been installed in the past several months, and a provisional system of cathodic protection has been provided. Further, all the lines laid since 1946 have received a coating composed of jute, asbestos or glass cloth and an asphaltic envelope.

Since the beginning of 1947 three branch pipelines have been put into service, namely: in January, Tarbes-Bazet, three and a half inches, 3.5 miles; in March, St. Gaudens-Mard, three and then two inches, seven miles; in May, Tarbes-Lourdes-Pierrefitte, five inches, then four and a half inches, 22 miles.

Besides these, construction of 25 miles of 12½ inch line connecting Boussens and Toulouse was finished on June 1, and two new fields have been opened along the routes. St. Marcet-Boussens, nine and a half inches, ten miles, and Capens-Pamers, five and a half inches, 34 miles.

Finally a decision has been taken to execute the project for a pipeline from Toulouse to Bordeaux (see map), which was agreed on two years ago. Its diameter will be eight inches, its capacity seven million cubic feet a day, and its length 150 miles.

When put into service, this line will afford a valuable source of fuel to the Bordeaux region, which is relatively remote from French coalfields and sources of supply for automotive fuel. In this connection it may be of interest to note that nearly 12,000 vehicles actuated by natural gas are in operation in Toulouse and neighboring plants.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F. M. Simpson

F. M. SIMPSON, familiarly known to his friends as "Jerry," has been appointed resident general manager of the new $30,000,000 lube plant which is to be built at Lake Charles, La., by Cities Service Oil Co. and Continental Oil Co. through the newly-organized Citcon Corp. He is in New York for the present while plans for the new plant are being perfected.

"Jerry" is a Texan who joined Cities Service as a junior engineer in 1923. He served successively as cost engineer, lube engineer and process engineer until 1943 when he was made general superintendent of refineries for Cities Service Oil Co. of Delaware which operates plants in Oklahoma and at Chicago from Bartlesville, Okla., headquarters.

Sperry-Sun Appointment

Appointment of Arthur B. Palmer as general sales manager of the Sperry-Sun Well Surveying Company was announced recently by Jno. G. Pew, president of Sperry-Sun, and vice president in charge of production of the parent Sun Oil Company.

Mr. Palmer joined Sun Oil Company as an engineer at Maracaibo, Venezuela, in 1922, immediately after his graduation from the University of Illinois where he received a degree in civil engineering. He joined the Sperry-Sun Well Surveying Company as a sales and service engineer in 1929. Since 1938 he has been a district manager for Sperry-Sun with headquarters at Lafayette, Louisiana.

Thor Thornson

Heads Airetool Sales

Thor Thornson has been appointed general sales manager of Airetool Mfg. Co., Epringfield, Ohio. He will be in charge of sales, advertising and promotion. As a refinery engineer, Mr. Thornson has spent 15 years in oil refineries on all types of operations in Michigan and Canada.

Exporter Adds Two New Lines

R. J. "Bob" Eiche, of Los Angeles and New York City, has recently been appointed export representative for Lewis Manufacturing Co. of Oklahoma City and for Page Oil Tools, Inc., of Long Beach, Calif. Exports of Lewis specialty oil-field products were formerly handled by Eiche through Well Equipment Mfg. Corp. Page manufacturers a line of production tools including anchors, tubing drains, oil and gas separators, bottom hole packers and down-squeeze packers.

In addition to the Lewis and Page representation, Eiche also handles for export the equipment manufactured by The Cavins Company, Corex Engineering Company, Eason & Therolf Tool Company, Eastman Oil Well Survey Company, Hamer Oil Tool Company, Hopper Machine Works, Inc., Pacific Perforating Company and Web Wilson Oil Tools, Inc.

Recovers Ethylene by Hypersorption

A commercial hypersorption unit recently designed and built by Foster Wheeler Corp. is producing 7,000 to 7,500 pounds per day of ethylene from mixed gases. The process is a development of Union Oil Co. of California. Product of the plant contains no methane and has a purity of 92 percent. In the application for which the plant was built, it was not necessary to separate the ethane from the ethylene. Composition of the product is currently: oxygen, 0.- percent; nitrogen, 0.1 percent; acetylene, 3.7 percent; ethylene, 92 percent; ethane, 1.0 percent, and carbon dioxide 3.1 percent.

Gases charged to the process contain only 5.7 percent ethane. Methane content is 49.2 percent; hydrogen, 37.2 percent; oxygen, 0.3 percent; nitrogen, 6 percent, carbon monoxide, 1.0 percent; acetylene, 0.3 percent; ethane 0.1 percent and carbon dioxide, 0.2 percent.

Revise Sun Toledo Unit

Catalytic Construction Co. is making the catalyst change at Sun Oil Company's twelve-case Houdry fixed-bed catalytic cracking unit, Toledo, Ohio. Six cases will be worked on at one time, while the other six remain on stream. Catalytic Construction crews have been active at Sun's Toledo refinery since June, 1946, on work which included construction of a kerosene sweetening unit, a propane plant, a dry gas purification unit, a boiler house and, currently, the revamping of Sun's existing gas plant.

Bechtel Corporation Appointments

A. J. Orselli has been appointed general manager of construction for Bechtel Corp., San Francisco. He has been with the Bechtel organization since 1933, most recently as division manager. In his new position he will be in charge of refinery construction.

Bert G. Aldridge has joined the Bechtel organization at Los Angeles. At one time he was chief engineer of Union Oil Co., but more recently has been assistant chief engineer of Fluor Corp.

Seek Refinery Engineer

The Iraqui government is seeking a refinery engineer to supervise construction of the government refinery to be built at Baiji, Iraq. Applicants must have administrative ability and at least ten years experience in refinery construction and operation. The successful applicant will be responsible to the government for fulfilment of the refinery construction contract regarding which an advertisement was published by the Iraq Embassy at Washington, D. C., in the June issue of WORLD PETROLEUM. The post will carry a salary of $600 to $800 per month plus a cost of living allowance of $100 per month.

Moves Offices

Transamerican Factors Ltd. has moved its U. S. offices to the Walter P. Story Bldg., 610 So. Broadway, Los Angeles 14. Victor E. Milch is resident partner in charge of these offices.

1,800 B H P vis-a-vis Gas Engine operating on natural gas. A Trinidad Oilfields Installation.

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P45

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Type HS-23B 23-inch rotary
Type HS-275B 27½-inch rotary

MORE *MODERN MACHINERY* **FROM**

Steel Supply An Oil Industry Problem

(Continued from page 43)

tons below the industry's productive capacity. There are a number of reasons for this. One outstanding reason is the critically short supply and poor quality of scrap. Other reasons are strikes in the coal fields, the unsatisfactory quality of coal and fuel oil and other factors.

Full-scale operation of existing capacity and of the planned increases in capacity will require uninterrupted production and a steady flow of the raw materials essential in steelmaking. The expansion program includes construction of additional facilities for handling and processing raw materials."

Among the projects under way which will contribute to the large investment referred to by Mr. Tower, one of the most important is the reconstruction and enlargement by the United States Steel Corporation of the great plant of the National Tube Company at Lorain, Ohio, on which $100,000,000 is being spent. While this is described as a rehabilitation job for the replacement of worn equipment and the installation of improved processes, one of its important features will be a unit for the production of 18,000 tons monthly of seamless pipe of small diameter, for which a greatly increased demand has developed since the close of the war.

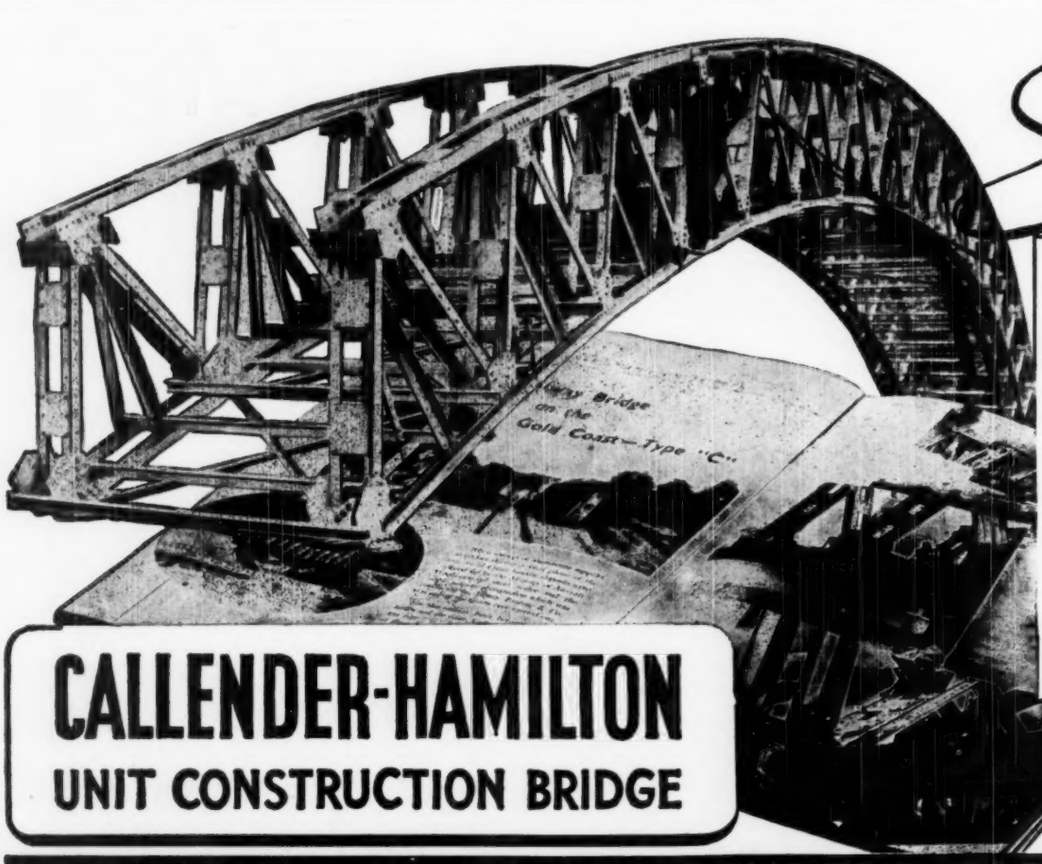
President Fairless of the United States Steel Corporation reported recently that the company as a whole was spending currently $20,000,000 a month on improved facilities for production and that scheduled additions and improvements would cost $500,000,000.

At Gadsden, Alabama, Republic Steel Corporation is erecting a mill for the fabrication of large-diameter line pipe as an addition to its steel plant. When completed the mill will produce electric welded steel pipe in diameters from 20 to 30 inches and in lengths up to 30 feet. The line pipe will be made from plates rolled in the company's adjacent plate mill. The plate will be cold formed into tubular shapes and electrically welded. The mill will be housed in two buildings 360 and 648 feet in length and 113 feet wide. It is expected to have the mill in operation by the latter part of 1948.

On the West Coast Columbia Steel Company has announced the construction of a cold reduction mill in the Los Angeles area to produce 300,000 tons of sheets per year. The mill is to be completed in 1949 and will employ 1,500.

A canvass of the larger steel companies indicates that practically without exception they all have formed extensive plans for the expansion of their facilities, although in some cases they are withholding the release of details because each such announcement brings a flood of inquiries and orders with which they are not yet prepared to cope.

In general the position of the leaders of the industry as to future developments is as follows: They foresee a continuing demand for their products on a level substantially higher than in the past. This they are planning to meet by the establishment of greater facilities of a well-balanced character from ore mine to finished products. In the second place they are still struggling with a huge temporary demand built up from accumulated wartime shortages which is gradually being overcome and which will be largely overcome before new capacity to meet the present peak could be constructed. Steel men are acutely aware of the fact that in the past the demand for steel has undergone wide fluctuations and that in the twenty-odd years between the two world wars, only 61 percent of mill capacity was in active operation on the average.


Here's the Story
Not the full story, we admit; it does not concern itself with detailed technical information but it does illustrate the flexibility of the Callender-Hamilton Bridging System for road, rail, foot or cable-carrying bridges in any part of the World. Write for publication No. 206 J on Callender-Hamilton Bridges.
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